

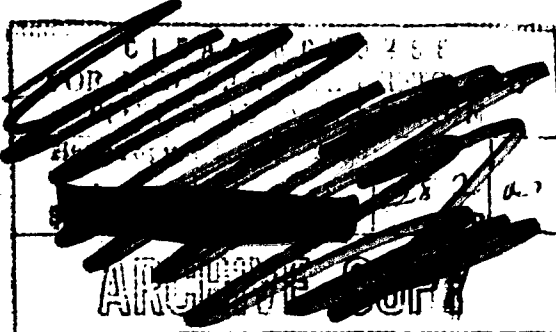
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FINAL TECHNICAL REPORT

STUDY OF PROGRAMMING DOCUMENTATION STANDARDS AND SPECIFICATIONS

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Data and Information Systems Division

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FINAL TECHNICAL REPORT

**STUDY OF PROGRAMMING
DOCUMENTATION STANDARDS
AND SPECIFICATIONS**

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PREFACE

This document represents the final technical report developed under Contract Number Nonr-4958(00) (NAVCROSSACT Project Number 90A012, Study of Programming Documentation Standards and Specifications). The basic document presents the research program implemented by ITT DISD in developing the NAVCROSSACT programming documentation standards and specifications which are provided in the Appendix.

1.0 Introduction

The objective of Project 90A012 was to develop standards and specifications for NAVCOSSACT programming documentation that would be generally applicable to all NAVCOSSACT projects. The standards were to be sufficiently broad, yet detailed enough to be applicable to programming documentation requirements of any NAVCOSSACT software system. The specifications for the various kinds of programming documents were to be derived from, and were to reference, the documentation standards, thereby enabling a consistency of documentation throughout all NAVCOSSACT projects. A hierarchy of documentation was to be established that would provide a logical relationship among documents and would permit sufficient flexibility for appropriately covering all types of software systems.

The technical activity for accomplishing the stated objective was divided into four basic parts as follows:

Part 1 - Determine NAVCOSSACT's scope of activities and programming documentation requirements through the evaluation of the current documentation techniques. The evaluation was to include the review of NAVCOSSACT and related Navy directives and instructions covering programming documentation and the interviewing of appropriate NAVCOSSACT personnel concerning the application of current procedures as well as recommendations for improvement.

Part 2 - Determine programming documentation techniques of other organizations by the collection and evaluation of existing non-NAVCOSSACT standards. Contacts were to be made with appropriate DOD, government, industrial, and standards agencies. These reviews were to assure utilization of all current standards and to provide for necessary standardization with other agencies.

Part 3 - Develop documentation standards and specifications for NAVCOSSACT based on the results of the Part 1 evaluation and the evaluation of existing documentation standards external to NAVCOSSACT.

Part 4 - Evaluate the proposed standards and specifications through scheduled reviews by selected NAVCOSSACT personnel. The results of this review cycle were to be factored into the final publications as appropriate.

0 Part 1 - Evaluation of NAVCOSSACT's Current Documentation Techniques

This activity consisted of two major tasks:

1. Review of documentation covering the current NAVCOSSACT requirements for programming documentation.
2. Interviews with appropriate NAVCOSSACT personnel.

1 Documentation Review

In the initial stages of the project, the significant guiding documentation was obtained in order to analyze NAVCOSSACT's current programming documentation requirements. The documents analyzed were NAVCOSSACT Instruction 5230.1A (Subject: Project Management Manual); OPNAV Instruction 5230.1A (Subject: Submission and Processing of Project Requests and the Prosecution of Projects for Command Systems Support); NCPAC Instruction 5230.3 (Subject: Policy and Guidance for Implementation of CINCPAC ADP Program); and SDC's TM-2314/000/00 (Subject:

Planning Guide for Computer Program Development). The formal programming documentation requirements currently in effect were derived from these documents. A generalized documentation system was developed and the requirements specified by each NAVCOSSACT document were compared against each other and against the generalized documentation system to determine variations among the basic documents. The contents, purpose, and scope of each currently required document were analyzed to determine coverage of the present documentation system. In addition, numerous samples of past and current documentation were reviewed to evaluate documentation practices within the framework of the present system.

2.2 NAVCOSSACT Project Personnel Interviews

Throughout Part 1, meetings and telephone discussions were held with the responsible NAVCOSSACT Project Leader and other assigned project personnel to obtain required information such as organizational relationships within NAVCOSSACT, between NAVCOSSACT and Users, and between NAVCOSSACT and other Navy Department Organizations; clarification of information in the basic documents; and background information regarding project development procedures within NAVCOSSACT. The project personnel also provided the necessary administrative support in obtaining the documentation for review and scheduling interviews with appropriate NAVCOSSACT operational personnel.

2.3 NAVCOSSACT Management Personnel Interviews

Early in Part 1, a meeting was held with the NAVCOSSACT management personnel. This meeting was primarily oriented toward outlining the broad scope of the over-all project to establish the general framework of the study

2.4 NAVCOSSACT Operational Personnel Interviews

During Part 1, interview meetings were set-up with NAVCOSSACT operational personnel to critique the current NAVCOSSACT documentation requirements and to obtain recommendations for the development of a more effective programming documentation system. In order to structure the meetings, a detailed interview form was prepared.

Personnel from the following NAVCOSSACT activities were interviewed:

- Data Processing Department
- Planning Systems Department
- Technical Command Systems Department
- Strategic Systems Department
- Support Systems
- Systems Integration Department

2.5 Conclusions from Part 1 Evaluation

The Part 1 evaluation highlighted the need for an up-grading and reorientation of the present NAVCOSSACT documentation system based on the expanding scope of NAVCOSSACT's project responsibilities and the increased complexity of ADP systems. The following basic conclusions were derived from this activity:

- a. The previously required system documentation was inadequate for the more complex systems for which NAVCOSSACT had become responsible. This was particularly true where a system was composed of several subsystems each having several programs. There was no requirement for formal subsystem specifications or program specifications although these were

often produced informally as design notes. Therefore, additional intermediate program design documentation would have to be included in the formal documentation hierarchy.

- b. The development of large complex systems increased the scope of previously required documents frequently causing them to be unwieldy, untimely, and incomplete. For example, the Preliminary Functional Description (PFD) for a large system could not be produced in the specified detail until late in the detailed design effort, often after some programming could have been started, making the document untimely. In addition, the size of such a PFD would tend to obscure much information required by the user's operational personnel such as data base requirements. Therefore, the required documents would have to be streamlined to permit effective accomplishment of their primary purposes and major segments would have to be extracted and specified as separate documents. This streamlining was to facilitate timeliness of all documents, permit orientation of each required document toward its particular readers, and expedite review and approval.
- c. The diversity of programming projects at NAVCOSSACT necessitated flexibility within the documentation system to assure sufficient documentation for necessary communication and yet preclude extraneous material produced for the sake of rigorous standardization. For example, a small project does not require all of the formal documentation necessary for a large project; an obvious omission for a small project would be a subsystem document. Therefore, a standard would have to be developed to permit controlling the scope of the documentation system as a function of program size and type.

- d. The requirement for documentation changes on a large, complex project necessitated an expeditious change procedure that would permit continuation of the project development activity while changes were being processed. Previously, the PFD was the only formal document in which all system descriptive material was retained with the resultant requirement for a complete approval cycle for minor detail modifications in the PFD. Therefore, a change procedure standard would have to be developed so that only major changes related to basic system performance need be processed through a full scale approval cycle.
- e. The increase in NAVCOSSACT projects and the diversity of projects required that the scope and format of material within a document be specified to a greater level of detail in order to insure comprehensive presentation of material. In addition, the larger population preparing and using the documentation required standardization for more effective use of the system documents. Therefore, the required documents would have to be specified in greater detail than previously required.

Part 2 - Evaluation of External NAVCOSSACT Documentation

Activity involved the review of documentation data solicited from approved DOD, government, industrial, and standards agencies. The implementation of the survey included trips to various agencies as well as tele- and correspondence contacts. In addition to the documentation data received from other agencies, all of the pertinent ITT DISD projects were reviewed for source material. Paragraphs 3.3 and 3.4 below provide lists of reference documents reviewed and agencies contacted as a part of this

3.1 Survey Plan

The Part 2 activity was based on three principal objectives as follows:

1. Determination of government, DOD, or Department of Navy direction or guidance in the preparation of project documentation and in particular programming documentation.
2. Determination of availability of appropriate documentation systems from other agencies that could be adapted for use by NAVCOSSACT.
3. Accumulation of source material for the development of a programming documentation system for NAVCOSSACT.

3.2 General Evaluation

The survey established that there were no detailed directions or instructions for the preparation of programming documentation per se. It was determined quite early in the survey that no MIL Standards or Specifications exist on the subject; the DOD Standardization Program is intended to promote standardization of items (equipment, supplies) identified in the Federal Supply Classification (FSC) System and does not cover documentation of computer program systems. However, guidance for the preparation of documentation (i. e., format, typography, production, etc.) was available and could be utilized as the basis for the appropriate standards in the NAVCOSSACT Documentation system.

It became evident as the survey progressed that no one agency had a complete set of programming documentation standards and specifications comparable to that planned for NAVCOSSACT. The survey results indicated that often local standards and guidance manuals on programming documentation existed

1 government and industrial agencies and activities. In general, these
een compiled to support the particular agencies' internal data processing
ties and were not sufficiently broad for direct adaptation to NAVCOSSACT
rements. (Examples of these documents were those received from the
al Services Administration, Navy Bureau of Ships, and Navy Bureau of
ons.)

the pertinent ITT DISD projects were reviewed for source material for
AVCOSSACT Documentation System. In addition, there was a consider-
umber of relevant documents collected from the survey of other agencies.
of the collected documents was analyzed and compared to all the other
ed material that had been accumulated. The desirable features of the
ent were then extracted for inclusion in the system. In this manner, a
icant part of the documentation system was synthesized from available
ial which had already been successfully used.


Ion-NAVCOSSACT Reference Material

SACCS Project 465L Documentation

ITT Data Processing Center Documentation

ADX System Documentation

- a. System Description
- b. Operations Manual
- c. Program Flow Diagrams
- d. Program Listings



Naval Tactical Data System (NTDS)

- a. Annotated Outline of a System Design Specification
- b. Annotated Outline of a Program Design Specification
- c. Command and Staff Guide Manual
- d. Program Operations Manual
- e. Documentation Requirements
- f. Directions Concerning Program Documents

General Files

- a. MIL-STD-218-1 (12/1954) Technical Manuals
Part 1 - General Outline for Technical Manuals
- b. MIL-STD-218-2 (1/1954) Technical Manuals
Part 2 - Production or Procurement of Artwork for
Technical Manuals
- c. MIL-STD-218-3 (1/1954) Technical Manuals
Part 3 - Preparation of Manuscript (Final, Typed) for
Technical Manuals
- d. MIL-D-5480D (2/1959) Data, Engineering and Technical:
Reproduction Requirements for
- e. Exhibit RADC-2668 (5/1959) Specifications, Military;
Instructions for Preparation of (by Contractors).
- f. MIL-M-005474C (USAF) (4/1960) Technical Manuals:
General Requirements for the Preparation of
- g. MIL-S-6644A (USAF) (9/1955) Specifications, Equipment,
Contractor-Prepared, Instructions for the Preparation of
- h. AFR5-5 Publications Policies, Responsibilities and Standards

- i. SECNAVINST P10462.7A Automatic Data Processing Equipment
- j. NAVMAT 4000.17 Project Management Manual
- k. SECNAV 3870.1 Use of Copyrighted Material in Navy Publications
- l. SECNAV 5600.15 Standards and Guidelines on the Distribution and Production of Publications and Printing
- m. OPNAVINST 5510.1B Security Manual for Classified Information
- n. PRC Paper 46.40 Information Flow Concepts, Notations, and Usages
- o. Automatic Data Processing Glossary - Bureau of Budget

3.4 Agencies Surveyed

- a. Department of Defense - OASD (I & L) Office of Technical Data and Standardization, Cameron Station, Alexandria, Va.
- b. U. S. Department of Commerce - National Bureau of Standards, Washington 25, D. C.
- c. Defense Documentation Center (DDC), 346 Broadway, New York City, New York
- d. Department of the Navy - Bureau of Ships, Washington, D. C.
- e. Department of the Navy - Bureau of Naval Weapons, Washington, D. C.
- f. Bureau of the Budget (BOB), Executive Office Building, Washington, D. C.
- g. General Services Administration (GSA), Office of Data and Financial Management - Data Processing Division, Washington, D. C.

- h. Department of the Army - Army Materiel Command, Technical Data Office, Standardization Branch (DepSO), Washington, D. C.
- i. Department of the Navy, Chief of Naval Materiel (DepSO), Washington, D. C.
- j. Department of the Air Force, Technical Data and Standardization Office, Washington, D. C.
- l. Federal Aviation Agency (FAA), Data Processing Division, 800 Independence Avenue SW, Washington, D. C.
- m. National Aeronautics and Space Administration, Office of Scientific and Technical Information, Maryland Avenue and 4th Street NW, Washington, D. C.
- n. American Standards Association (ASA), 10 East 40th Street, New York City 16, New York
- o. Business Equipment Manufacturers' Association (BEMA), 234 East 42nd Street, New York City 17, New York
- p. Electronic Industries Association (EIA), 11 West 42nd Street, New York City 36, New York
- q. Association for Computing Machinery (ACM), 14 East 69th Street, New York City 21, New York
- r. American Federation of Information Processing Societies (AFIPS), 211 East 43rd Street, New York City 17, New York
- s. Data Processing Management Association (DPMA), 524 Busse Highway, Park Ridge, Illinois
- t. Society of Technical Writers and Publishers (STWP), P.O. Box 3706, Beechwood Station, Columbus, Ohio
- u. American Documentation Institute (ADI), 2000 P Street NW, Washington, D. C.
- v. American Management Association, Inc., 135 West 50th Street, New York City, New York

- w. Western Reserve University, Center for Communication and Documentation Research, Cleveland 6, Ohio
- x. Systems and Procedures Association, 7890 Brookside Drive, Cleveland 38, Ohio
- y. U. S. Steel Corporation, Carnegie Building, Pittsburgh, Pa.
- z. Secretary-Treasurer 1620 Users Group, University of Oklahoma - Computer Lab, Norman, Oklahoma
- aa. IBM Corporation, Office of Group Director of Standards, Armonk, New York
- bb. The MITRE Corporation, P.O. Box 208, Bedford, Mass.
- cc. American Specification Institute, 134 N. LaSalle Street, Chicago, Illinois
- dd. Standards Engineers Society, 170 Livingston Avenue, New Providence, New Jersey
- ee. National Office Management Association (NOMA), Willow Grove, Pa.
- ff. Department of the Air Force - Systems and Logistics (Dep So) Washington, D. C.

3.5 Conclusions from Part 2 Evaluation

The Part 2 evaluation established the fact that current government direction only covers general documentation preparation and does not provide guidance specifically for programming documentation. It was also determined that no other agency had a complete set of programming documentation standards and specifications comparable to that planned for NAVCOSSACT.

The major positive result from the Part 2 activity was the accumulation of standards, specifications, and programming documentation which when analyzed provided a substantial data bank for the synthesis of the specific NAVCOSSACT documents.

4.0 Part 3 - Development of Standards and Specifications

The development of standards and specifications was essentially a two step process requiring; first, the determination of an appropriate hierarchy of standards and specifications and second, development of the detailed contents of each standard and specification. In addition, the development process consisted of three distinct phases: first, the establishment of an initial documentation hierarchy and development of preliminary drafts based on the results of the Part 1 and Part 2 evaluations; second, the evolutionary modification of both the hierarchy and documentation contents during the development period; and third, the modifications to the documentation system based on NAVCOSSACT's review of the drafts.

The Part 1 activity, Evaluation of NAVCOSSACT's Current Documentation Techniques, was essentially completed prior to the initiation of the development activity. However Part 2, Evaluation of External NAVCOSSACT Documentation Standards, was only partially complete because of the delayed response of many of the contacted agencies. Those responses received subsequent to the initiation of the development activity were used to test the preliminary products and new elements of documentation were appropriately factored into the system.

4.1 Development of Documentation System Hierarchy

The establishment of the documentation hierarchy was the first step in the development process. The initial hierarchy was based on the analysis of the Part 1 and Part 2 evaluations and was presented to NAVCOSSACT for review in the Part 1 Report, NAVCOSSACT Programming Documentation Project. In effect, this initial presentation delineated the scope of the remaining activities. It also established the relationship of documentation to the programming activity, the relationships among the documents

themselves, and the relationship between the specifications and the standards. Of primary importance, this initial presentation of a documentation hierarchy provided a basis for the development of the detailed elements of the system. (Reference Figure 1 for final hierarchy.)

During the development of the detailed standards and specifications, more effective organization and categorization of material became evident and was implemented in the draft package that was being prepared for NAVCOSSACT review. This was particularly significant with regard to the standards resulting in a more definitive presentation of material.

4.2 Development of Standards and Specifications

After establishing the documentation tree, development of the individual elements (i. e. , standard or specification) was commenced. A principal source for this effort was the available material from NAVCOSSACT. In addition, documentation data obtained in the Part 2 survey provided significant supplementary information.

The standards were generally derived from the NAVCOSSACT standard procedures and governing DOD, Department of Navy, and government directive documents as well as from material under development by industry standards agencies such as flow diagram symbology. In addition to general documentation instructions, NAVCOSSACT environment oriented programming documentation standards such as Documentation Phasing, Document Review and Approval, and Project Documentation Guideline were developed based, to a large degree, on the results of the Part 1 interviews.

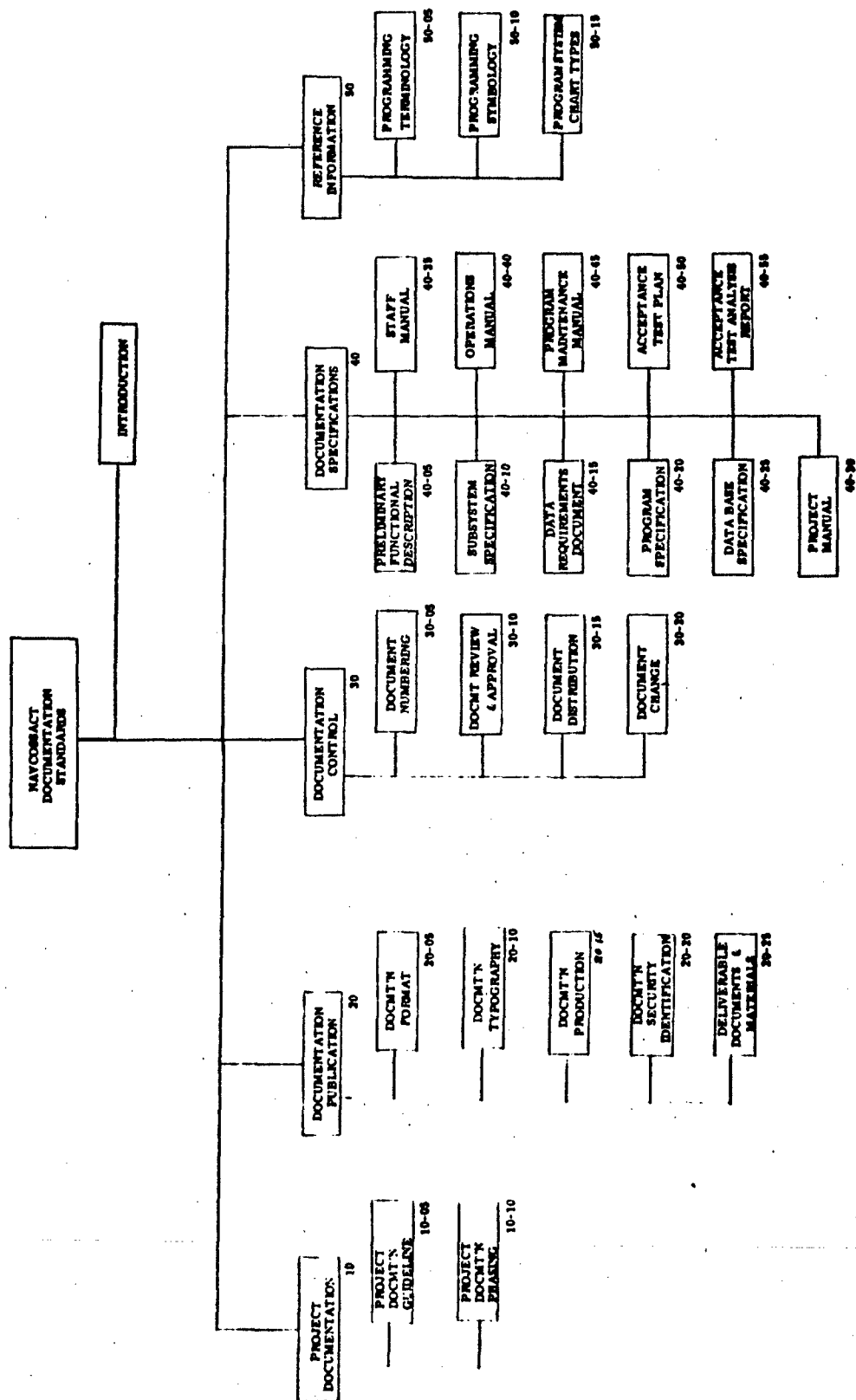


FIGURE 1 NAVCOMBAT STANDARDS TREE

The individual document specifications were structured from the directive material at NAVCOSSACT, the results of the interviews with NAVCOSSACT personnel, and the system documentation from completed NAVCOSSACT projects. The basic structures were then enhanced by definitive descriptions of required material which was, in a large part, derived from the material obtained from the Part 2 survey.

4.3 Conclusions from Part 2 Development Phase

The development phase was concluded by the preparation of a complete set of preliminary standards and specifications which were delivered to NAVCOSSACT for review and comment. In addition to providing a substantially completed package from the standpoint of document content, this interim publication permitted the preparation of alternative presentation techniques such as document formats and the use of charts and examples for NAVCOSSACT evaluation.

The development effort resulted in a substantiation of the basic premise that a set of documentation standards and specifications could be provided for the spectrum of program system types. However, this activity did highlight the problem of establishing criteria for evaluating the trade-off between specificity and general application; for example, specifying the requirement for a detailed description of an element (inputs, outputs, etc.) in a system or subsystem document may, in some instances, affect the required timing of the document. It also revealed the importance of the Part 4, NAVCOSSACT review to establish the best level of generalization for NAVCOSSACT's over-all requirements.

5.0 Part 4 - NAVCOSSACT Evaluation of Preliminary Standards and Specifications

This effort provided for NAVCOSSACT review of a preliminary documentation package. The review served to orient the standards and specifications toward NAVCOSSACT's immediate needs.

The activity was conducted by the NAVCOSSACT Project Leader and his staff. Elements of the preliminary documentation package were delivered to the Project Leader as soon as they became available and copies were then fanned out to the various functional organizations within NAVCOSSACT for review. The organizations were requested to review the documents for applicability to their own activities; it was noted that any resultant inconsistencies with a generalized documentation system would be resolved in a final coordination review. After all of the preliminary material had been reviewed by the individual organizations, the NAVCOSSACT Project Leader scheduled a series of coordination meetings for review of the individual standards and specifications. All of the functional NAVCOSSACT organizations were represented at these meetings insuring a universality of view points. Each standard and specification was reviewed in detail; consideration was given to an element's function, reader orientation, format, content, level of detail, and relationship to other elements in the documentation system. The results of the NAVCOSSACT effort were then returned to the Contractor for final review and publication.

5.1 Conclusions from Part 4 NAVCOSSACT Evaluation

The Part 4 evaluation resulted in an important focusing on NAVCOSSACT's particular requirements which could only be derived through intensive review by the ultimate documentation implementers. As a result of this evaluation, the standards were modified to reflect the current as well as the anticipated NAVCOSSACT environment and the specifications were generalized by emphasizing the ultimate responsibility of the Project Leader in determining the documentation requirements for his project. In effect, the major consequence of the Part 4 effort was a more general orientation of the documentation package which made it universally adaptable to the broad spectrum of the NAVCOSSACT programming projects. Specific modifications resulting from the NAVCOSSACT evaluation are summarized below.

Documentation Hierarchy - There were several modifications to the preliminary documentation hierarchy. The Project Manual was originally conceived as a distinct document retaining the functional material of the Staff, the Operations, and the Program Maintenance Manuals, but combining general introductory material of the latter three manuals into a single introduction. Based on the review, the Project Manual will provide for binding the other three manuals into a single volume with no textual change. A second modification to the specification tree provided for combining the Acceptance Test Plan and Acceptance Test Specification into a single document under the title of Acceptance Test Plan. In addition, there was some restructuring of the standards to provide a more effective presentation of material for NAVCOSSACT's particular requirements.

Standards Content - Standards modifications were recommended to provide for compatibility with current NAVCOSSACT definitions and procedures. In order to clarify the meanings of certain standards, it was recommended that illustrative examples be included such as formats for tables, illustrations, and equations. Modifications were also recommended to maintain consistency with current procedures; e. g., the Documentation Security Identification Standard was appropriately changed for compatibility with current security practices.

Specifications Content - Modifications to certain specifications were recommended as a result of greater definitization of documentation functions. These changes included the elimination of material in order to insure appropriate documentation phasing and the transferring of material between specifications in order to facilitate review and approval cycles. In addition since the content of the specifications was sufficiently universal in

meaning, many examples and illustrations in the preliminary documents could be removed. Further, one specification was substantially modified; the orientation of the Data Requirements Document was changed to provide a more effective tie-in to the Data Element Library effort currently being implemented at NAVCOSSACT.

6.0 Conclusions

The objective of the Project; namely, the development of standards and specifications for NAVCOSSACT programming documentation, was successfully achieved. In addition to providing a substantially more comprehensive documentation system, the integration of the standards and specifications furnishes a basis for progressive extension of the system by NAVCOSSACT.

The development technique consisting of a review of current NAVCOSSACT procedures, a survey of other organizations, preparation of a preliminary documentation package, and comprehensive review by NAVCOSSACT personnel prior to final publication insured delivery of a workable documentation system tailored to NAVCOSSACT's requirements.

The NAVCOSSACT documentation system should provide substantial assistance to the implementer in documenting a programming project. On the other hand, the requirement for more comprehensive documentation will impose a heavier document writing burden on him. Therefore, the next step in the documentation development cycle should be the design of tools to assist the systems implementer in production of the required documentation. The documentation system presented in the Appendix of this Report implicitly suggests the development of automated techniques such as computerizing data common to several different system documents and automating the documentation change procedure.

The Appendix to the Report provides the Programming Documentation System developed for NAVCOSSACT under this project. It consists of a complete set of programming documentation standards and specifications. The inclusion of a definitive end product precludes the presentation of a more comprehensive report since the reader can easily recognize the detailed development activities implied in the results.

REFERENCES

Project Generated

Part 1 Report, NAVCOSSACT Programming Documentation Project;
(6/1965), ITT DISD

NAVCOSSACT

NAVCOSSACT Instruction 5230.1A, Project Management Manual
(7/1964)

TM-2314/000/00, Planning Guide for Computer Program Development; (5/1965), SDC

Information Flow Concepts, Notations, and Usages; (2/1964)
PRC Paper 46.40

The Wordsmiths Guide, Technical Service Division; (6/1964)
NAVCOSSACT

Contractor

SACCS Project 465L Documentation

ITT Data Processing Documentation

ADX System Documentation

- a. System Description
- b. Operations Manual
- c. Program Flow Diagrams and Listings

Naval Tactical Data Systems (NTDS)

- a. Annotated Outline of a System Design Specification
- b. Annotated Outline of a Program Design Specification
- c. Command and Staff Guide Manual
- d. Program Operations Manual
- e. Documentation Requirements
- f. Directions Concerning Program Documents

General

OPNAV Instruction 5230.1A, Submission and Processing of Project Requests and the Prosecution of Projects for Command Systems Support (10/1964)

CINCPAC Instruction 5230.3, Policy and Guidance for Implementation of CINCPAC ADP Program (4/1965)

MIL-STD-218-1 (12/1954) Technical Manuals

Part 1 - General Outline for Technical Manuals

MIL-STD-218-1 (1/1954) Technical Manuals

Part 2 - Production or Procurement of Artwork for Technical Manuals

MIL-STD-218-3 (1/1954) Technical Manuals

Part 3 - Preparation of Manuscript (Final, Typed) for Technical Manuals

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Exhibit RADC-2668 (5/1959) Specifications, Military: Instructions for Preparation of (by Contractors)

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General Requirements for the Preparation of

MIL-S-6644A (USAF) (9/1955) Specifications, Equipment,

Contractor-Prepared, Instructions for the Preparation of

AFR5-5 Publications Policies, Responsibilities and Standards

SECNAVINST P10462.7A Automatic Data Processing Equipment

NAVMAT 4000.17 Project Management Manual

SECNAV 3870.1 Use of Copyrighted Material in Navy Publications

SECNAV 5600.15 Standards and Guidelines on the Distribution

and Production of Publications and Printing

OPNAVINST 5510.1B Security Manual for Classified Information

Automatic Data Processing Glossary - Bureau of Budget

APPENDIX

NAVCOSACT PROGRAMMING DOCUMENTATION STANDARDS AND SPECIFICATIONS

NAVCOSACT STANDARDS	SUBJECT TABLE OF CONTENTS	NUMBER	
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NAVCROSSACT STANDARDS	SUBJECT NAVCROSSACT DOCUMENTATION SYSTEM	NUMBER Introduction	
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1. PURPOSE

The purpose of the documentation system is to provide standardization and guidance for the preparation of computer programming documentation.

2. SCOPE

The documentation system provides that all system development functions from preliminary design to final test be supported by appropriate documentation. The documentation system outlines the content and format of each document and provides selection, publication, control, and reference standards for the documents to be produced for each program project. The project complexity factor may be used as a guide to the number of different documents which will be selected to support a particular program project. The final choice of documents, however, is the decision of the Project Leader, and this choice should also consider other factors, such as type of project (functional, support), amount of programming, size of project. Each document described herein serves a particular purpose(s), and the Project Leader will decide its necessity in the documentation for his project.

3. OBJECTIVES

- a. To specify the content of each document.
- b. To allow sufficient flexibility in the number of different documents to be prepared for each program project.
- c. To specify document formats and other editorial and typographical requirements.

NAVCROSSACT STANDARDS	SUBJECT NAVCROSSACT DOCUMENTATION SYSTEM	NUMBER Introduction	
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- d. To reference the established procedures for processing and handling documentation.
- e. To provide management control through development of standards.

4. ORGANIZATION

- 10. Project Documentation. Standards which establish the scope of the documentation effort required to support projects of varying programming complexity.
- 20. Documentation Publication. Standards which establish constraints on the preparation and production of programming documentation.
- 30. Documentation Control. Standards which establish procedures for the identification and handling of programming documentation.
- 40. Documentation Specifications. Standards which specify the format and content of NAVCROSSACT programming documentation.
- 50. Reference Information. Standards which summarize information specialized to programming systems technology.

Individual standards are identified in the NAVCROSSACT STANDARDS tree diagram in Figure 1.

NAVCOSACT STANDARDS

SUBJECT

NAVCOSACT DOCUMENTATION SYSTEM

NUMBER

Introduction

PAGE

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OF

3

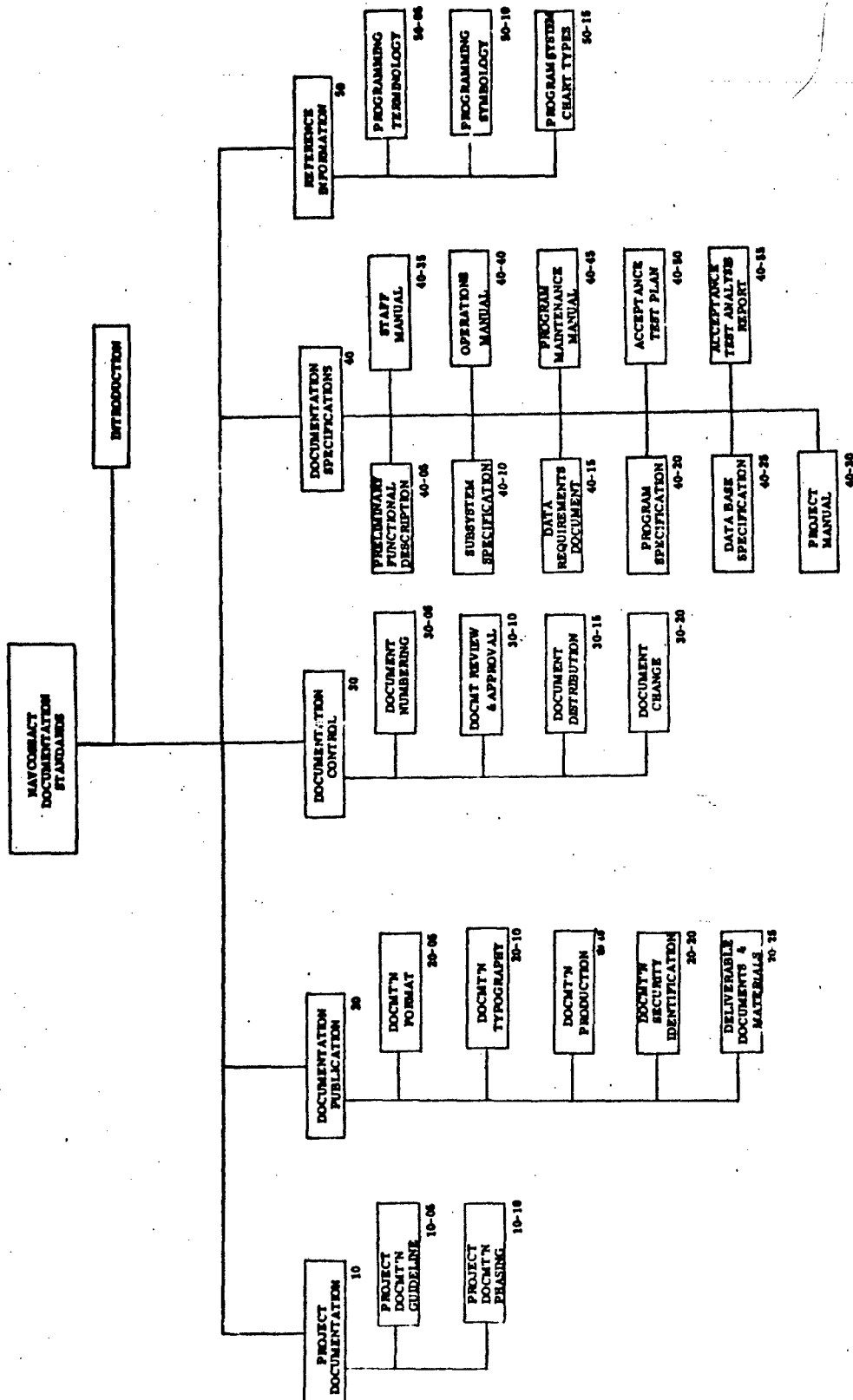


FIGURE 1 NAVCOSACT STANDARDS TREE

NAVCROSSACT STANDARDS	SUBJECT PROJECT DOCUMENTATION GUIDELINE	NUMBER 10-05	
		PAGE 1	OF 3

1. PURPOSE

To establish a guideline for the number of different documents to be prepared to support a particular NAVCOSSACT program project.

2. PROJECT DOCUMENTATION VARIATIONS

This standard provides guidance for adapting a project's documentation to project complexity. However, the Project Leader may use other factors to decide what documents he needs to support his project; e.g., type of project (support or functional), amount of programming, size of project. For small projects he may need a minimum of documentation, which will reduce the document preparation and production effort. For large projects, complete documentation of all phases of effort may be needed, which will provide:

- a. Control and coordination of concurrent and consecutive program design effort.
- b. Coordination of program requirements and program operation with user personnel.
- c. Record of project for maintenance or reconstruction of delivered system if required.
- d. Reference record for planning and design of subsequent projects.

3. DOCUMENTATION TYPES

The specific types of documents which may be provided to support a programming project are as follows:

NAVCOSACT STANDARDS	SUBJECT PROJECT DOCUMENTATION GUIDELINE	NUMBER 10-05	
		PAGE 2	OF 3

Preliminary Functional Description
 Data Requirements Document
 Subsystem Specification (per subsystem)
 Program Specification (per program)
 Data Base Specification
 Project Manual
 Staff Manual
 Operations Manual
 Program Maintenance Manual
 Acceptance Test Plan
 Acceptance Test Analysis Report

The format and content of each of these document types except for the Project Manual is given in STD 40. The Project Manual is a single volume presentation of the other three manuals with no textual variation; therefore, a specific specification is not included for the Project Manual.

4. PROJECT DOCUMENTATION GUIDE
 A guide to the documentation which may be generated for projects with various complexity factors is shown in Table 1. The project complexity factor is A, B, C, D, E as defined in NAVCOSACT Instruction 5230.1A.

NAVCOSACT STANDARDS

SUBJECT

PROJECT DOCUMENTATION GUIDELINE

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TABLE 1

PROJECT TYPE	APPLICABLE DOCUMENTATION									
	SYSTEM		DESIGN			MANUALS				TEST
	PRELIMINARY FUNCTIONAL DESCRIPTION	DATA REQUIREMENTS	SUBSYSTEM SPECIFICATION	PROGRAM SPECIFICATION	DATA-BASE SPECIFICATION	PROJECT SPECIFICATION	MANUAL STAFF	MANUAL OPERATIONS	PROGRAM MAINTENANCE MANUAL	ACCEPTANCE TEST PLAN
A	X	X	X	X	X		X	X	X	X
B	X	X	X	X	X		X	X	X	X
C	X	X	X	X	X	X			X	X
D	X			X		X				X
E	X			X		X				X

NAVCROSSACT STANDARDS	SUBJECT PROJECT DOCUMENTATION PHASING	NUMBER 10-10	
		PAGE 1	OF 3

1. PURPOSE

To indicate in a representative manner the phasing for the preparation, management review and approval of NAVCROSSACT programming documentation.

2. PHASING CONSTRAINTS

The preparation of programming documentation must meet the following constraints.

- a. **Logical Document Sequence.** The documentation system provides for document preparation which reflects the activity at different phases of the development effort. Documentation must be phased for production when its source material is logically anticipated.
- b. **Minimum Lag Interval.** Production of documentation should be undertaken as soon as a workable amount of source material is available. In many instances this will be some time prior to the availability of final source documentation. Under these circumstances, document production must be scheduled so that a source document is formally released prior to the release of a lower order document.
- c. **Project Complexity Factor.** The project complexity factor (A, B, C, D, E) as defined in NAVCROSSACT Instruction 5230. 1A is used herein to provide a guide to the types of documentation which may be used to support a programming project (see STD 10-05). Document preparation as a function of project complexity is therefore included in the phasing process.

NAVCOSSACT STANDARDS

SUBJECT

**PROJECT DOCUMENTATION
PHASING**

NUMBER

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3

3 PHASE INTERVALS

Time intervals (in weeks) are associated with each phase of document preparation. The intervals are to be considered as representative, rather than binding, and are stated as being in one of the following ranges.

- a. 1-2 weeks
- b. 2-4 weeks
- c. 4-8 weeks
- d. 8-16 weeks

The level of activity in each phase (man-weeks, man-months) is a function of project size and is not included.

4 DOCUMENTATION PHASING

The preparation of programming documentation begins with the preparation of the Preliminary Functional Description and concludes with the Acceptance Test Analysis Report. Administrative activities associated with initiation and termination of the project are not considered in this standard.

The over-all document phasing associated with a programming project is shown in Figure 1.

NAVCOSACT STANDARDS

SUBJECT

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NUMBER

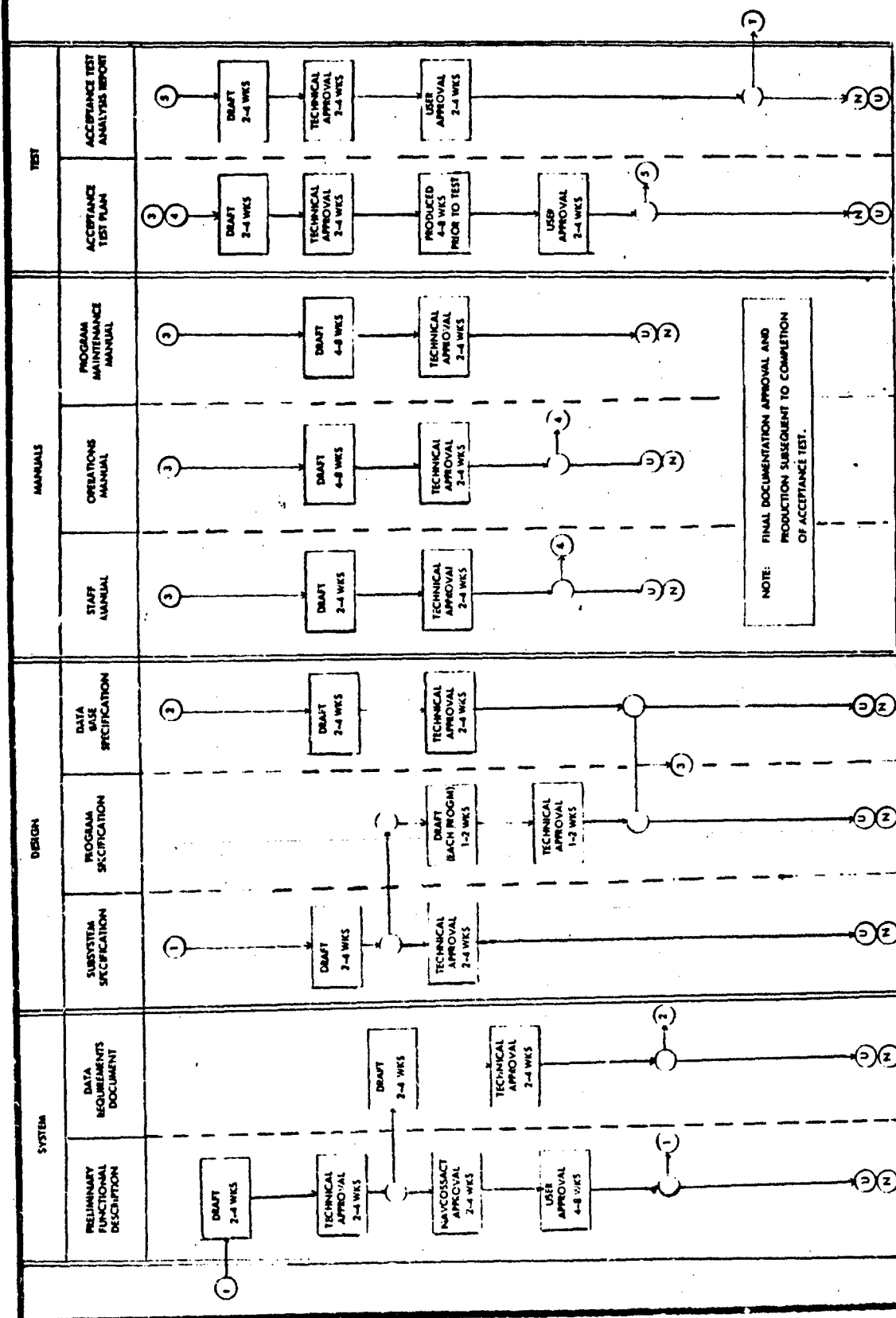
10-10

PAGE

3

OF

3



THIS CHART IS REPRESENTATIVE OF THE PHASING FOR A PROJECT REQUIRING A COMPLETE SET OF DOCUMENTATION. THE FLOW AND TIMING ARE SIMILAR FOR PROJECTS WITH LIMITED DOCUMENTATION REQUIREMENTS.

FIGURE 1 NAVCOSSACT DOCUMENTATION PHASING

NAVCROSSACT STANDARDS	SUBJECT DOCUMENTATION FORMAT	NUMBER 20-05	
		PAGE 1	OF 5

1. PURPOSE

This standard establishes the format requirements for NAVCROSSACT documentation.

2. GENERAL FORMAT REQUIREMENTS

Documentation is to be structured from the following parts ordered in the sequence listed.

- | | |
|--------------------------------------|---------------|
| a. Front Cover | (Mandatory) |
| b. Special Notices | (As Required) |
| c. Revision Sheet | (As Required) |
| d. Abstract | (Optional) |
| e. Title Page | (Mandatory) |
| f. Table of Contents | (Mandatory) |
| g. List of Illustrations | (As Required) |
| h. List of Tables | (As Required) |
| i. List of Abbreviations and Symbols | (Optional) |
| j. Text | (Mandatory) |
| k. References | (Optional) |
| l. Bibliography | (Optional) |
| m. Appendices | (As Required) |
| n. Back Cover | (Mandatory) |

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3. DETAILED REQUIREMENTS

3.1 Front Cover. The front cover will contain the following information.

- a. Activity name and seal
- b. Document type (see STD 10-05)
- c. Document description (title and sub-title)
- d. NAVCOSSACT document number (see STD 30-05)
- e. Security Identification, as required (see STD 20-20)

An example of a layout of a cover is shown in Figure 1.

3.2 Special Notices. Special information relating to the status of a document and instructions for its handling.

3.3 Revision Sheet. The revision sheet will be a cumulative record of all changes made in the document since original publication. The changes will be identified by document number, date, pages affected and brief description of change.

3.4 Abstract. A brief summary of presentation (150-250 words), preferably unclassified, including any special circumstances, features, techniques or other material to provide orientation for the reader.

NAVCROSSACT STANDARDS	SUBJECT DOCUMENTATION FORMAT	NUMBER 20-05	
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FIGURE 1 - COVER LAYOUT

CLASSIFICATION

Activity

NAVAL COMMAND SYSTEMS

Seal

SUPPORT ACTIVITY

DOCUMENT TYPE

DOCUMENT TITLE

DOCUMENT SUB-TITLE

DOWNGRADING
NOTICE

DISTRIBUTION
NOTICE

NAVCROSSACT DOCUMENT NO.

CLASSIFICATION

**NAVCROSSACT
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20-05

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4 **5**

3.5 Title Page. The title page will include the same information and format as the cover page with the addition of preparation credit by organization or codes and publication data, both centered directly beneath the document description information.

3.6 Table of Contents. Document contents will identify the section/paragraph number, title or heading, and page number. The contents will be tabulated down to three decimal numbering positions.

3.7 List of Illustrations. The list will account for each numbered illustration, by figure number, title, and page number.

3.8 List of Tables. The list will account for each numbered table by table number, title, and page number.

3.9 Text. The text will follow the prescribed content for the type of document in preparation. Refer to NAVCOSSACT STD 40 for applicable format. In addition to the narrative, tables, diagrams, and illustrations may be employed to convey, clarify, or illustrate the technical content.

3.10 Appendix. The appendices will contain material which supports but is not essential to the text. Appendices will be separately titled and "numbered" alphabetically. A single appendix will be titled only.

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		PAGE 5	OF 5

3.11 References. A list of references will be provided if more than five titles are cited in the text. Each reference will contain Title, Date, Document Number and Classification, Author and Publisher if applicable. The titles of books, papers, reports, pamphlets will be underlined; the titles of articles within a publication will be placed in quotation marks.

3.12 Bibliography. The bibliography will include the same type of information as required for references, arranged alphabetically by author.

3.13 Back Cover. Unprinted, except for security classification if required.

NAVCSSACT STANDARDS	SUBJECT DOCUMENTATION TYPOGRAPHY	NUMBER 20-10	
		PAGE 1	OF 8

1. PURPOSE

This standard establishes typography conventions.

2. PREPARATION

Documentation will be prepared in final form by typing onto appropriate master stock using a standard type face (e. g., bold face, elite). The typing area will be 6 X 9 inches centered on an 8 X 10-1/2 final sheet size. The text will extend across the entire page between the margins (no text columns). Single line or line and a half spacing may be used.

3. TEXT DIVISION

The text of the document is divided into sections, paragraphs, and sub-paragraphs. A decimal numbering system will be used, and each numbered division will be identified with a subject title. Paragraph numbering will not exceed four decimal levels. Revision of the text organization will be made, as necessary, to conform to the four level constraint. This page is an example of section and paragraph divisions and numbering.

3.1 Sections. Sections are the primary text divisions and will be identified by a fully capitalized subject title. The section number and title may start a new page of a document and will be left justified to the upper left corner of the typing page. A double horizontal space will be provided between the section number and the section title. A double vertical space or space and a half will be provided between the section title line and the first section paragraph.

NAVCOSACT STANDARDS	SUBJECT DOCUMENTATION TYPOGRAPHY	NUMBER 20-10	
		PAGE 2	OF 8

3.2 Paragraphs and Subparagraphs. The number and title will be left justified. Two horizontal spaces will be provided between the paragraph number and the title. The first letter of each major word of the title will be capitalized and the title itself immediately followed by a period. The paragraph text will start on the same line as the paragraph title, separated from the title period by two horizontal spaces. The text will start with the first letter capitalized. All paragraph text will be left justified. A double line space will be provided between individual paragraphing.

3.3 Itemization. Itemization of elements within a paragraph and subparagraph may be used in lieu of formal subparagraphing. Such itemization will be restricted to brief statements or word groups for which decimal numbering would be awkward. Items will be identified by lower case letters followed by a period. The letters will start six horizontal spaces from the left margin of the typing area. Two horizontal spaces will be provided between the letter period and the start of the item. The first letter of the item will be capitalized. Additional lines under each element will be aligned with the start of the first line. A single line space will be used between items.

4. TABLES

Tables, depending upon their size and relationship to the text, may be included with the text or typed on separate pages.

4.1 Text Tables. A text table has an open format, appears within the text, and is completely identified by the text; it has neither title nor number. It will usually be a part of the sentence that identifies it. An example of a text table is shown in Figure 1(a) on the following page.

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DOCUMENTATION
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8**

4.1 Example. The C160-A EXF codes for the Control Alarm are in the range 2270 through 2277. Any of the EXF codes 2270 through 2272 select the Control Alarm; any other code deselects it.

2270	Turn on alarm 1 indicator
2271	Turn on alarm 2 indicator
2272	Turn on alarm 3 indicator

An intermittent audible alarm also sounds when any indicator is on.

FIGURE 1(a) TEXT TABLE (EXAMPLE)

**TABLE 4-01
TAPE FUNCTION CODES**

Octal	Binary Bits 29-31	Tape Unit Function
0	000	Read Binary
1	001	Read BCD
2	010	Write Binary
3	011	Write BCD
4	100	Advance One Record
5	101	Write EOF
6	110	Backspace One Record
7	111	Rewind to Load Point

FIGURE 1(b) FREE TABLE (EXAMPLE)

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4 **8**

4.2 Free Tables. A free table has a closed format (ruled heading and columns) and appears as a separate page with its own title, table number, and page number. The table will appear immediately after the first reference to it in the text. Tables, when physical size exceeds the carriage capacity of the typewriter will be rendered by graphic techniques and photo-reduced for inclusion in the final document. Free tables will be identified by the nomenclature "TABLE M-NN" where M is the section number (first decimal number) and NN is the consecutive count of tables within the section. The table number will be centered at the top of the table. The table identification will also include a title - a brief summary of the table content - rendered in upper-case type directly beneath the table number. An example of a free table is shown in Figure 1 (b) on the previous page.

5. ILLUSTRATIONS

Illustrations refer to the use of line work for diagrammatic (flow charts), geometric, or pictorial representations of information. Normally such materials are produced oversize and photo-reduced for inclusion in the final document.

Line work will follow the originators source material to the greatest extent, consistent with left-to-right, top-to-bottom conventions for the progression of information and an efficient utilization of the available page size. Line weight will be varied to provide emphasis as required. Annotation of the line work will logically account for all the elements shown, with callouts, legends and notes as appropriate. All annotations will be upper case, with character size (and weight) varied to provide emphasis as required. Typing

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may be used to annotate the line work in lieu of lettering or other graphic techniques provided that any photo reduction involved does not exceed 2 : 1. Typing may be done directly on the original line work or on transparent material which is then cut to size and affixed to the original.

Illustrations will be identified by the nomenclature "FIGURE M-NN" where M is the main section (first decimal number) where the figure appears, and NN is the consecutive count of figures within the section. The figure number will be centered at the bottom of the figure page. The figure identification will include a title - a brief summary of the content of the figure - directly beneath the figure number. An example of a line work illustration is shown in Figure 2.

6. EQUATIONS

Equations important to the presentation in the text will be "displayed" - placed on separate lines from the text. A series of equations will be aligned on the equality signs and centered on the page. Each equation will be numbered for reference using the nomenclature "(M-NN)," where M is the main section number (first decimal number), where the equation appears and NN is the consecutive count of equations within the section. The number will be positioned to the left of the equation line and aligned with all other equation numbers which appear on the page. An example of an equation "display" is shown in Figure 3.

NAVCOSACT STANDARDS	SUBJECT DOCUMENTATION TYPOGRAPHY	NUMBER 20 10	
		PAGE 5	OF -

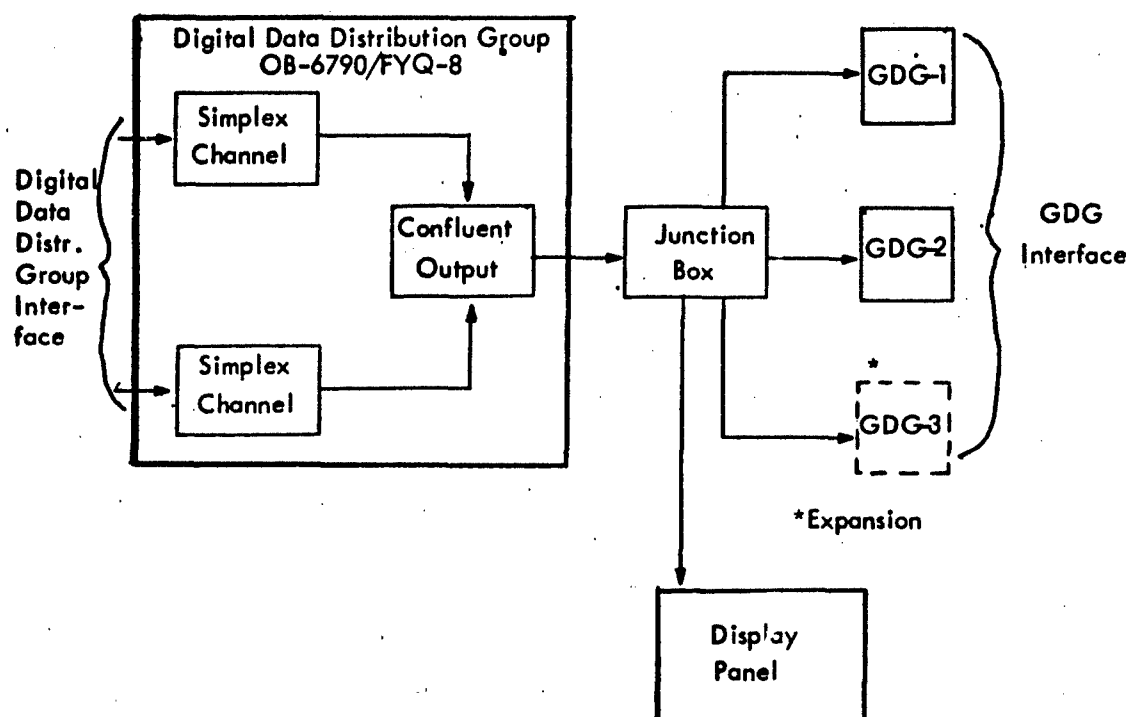


FIGURE M 44

BLOCK DIAGRAM
DIGITAL DATA DISTRIBUTION

FIGURE 2 LINE WORK ILLUSTRATION (EXAMPLE,

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STANDARDS**

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TYPOGRAPHY**

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6.1 Example. The following set of equations represents a system of 4 linear, non-homogeneous equations in 3 unknowns.

$$(6-01) \quad a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1$$

$$(6-02) \quad a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2$$

$$(6-03) \quad a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3$$

$$(6-04) \quad a_{41}x_1 + a_{42}x_2 + a_{43}x_3 = b_4$$

The presentation or display of these equations in paragraph 6.1 illustrates the rules of Section 6 preceding.

FIGURE 3 DISPLAY OF EQUATIONS (EXAMPLE)

NAVCOSACT STANDARDS	SUBJECT DOCUMENTATION TYPOGRAPHY	NUMBER 20-10	
		PAGE 8	OF 8

7. PAGE NUMBERING

7.1 Text. Text pages will be numbered consecutively in arabic numerals centered 3/8 inch (3/4 inch on classified documents) from the bottom of the page. Tables and illustrations will be incorporated (as separate pages) into the text immediately following the first reference in the text and will be included in the text page count. The last page of the text will carry the notation: "(END OF TEXT)" beneath the page number.

7.2 Pre-Text. Pre-Text pages will be numbered consecutively in lower case roman numerals starting with the page immediately following the front cover. However, pages up to and including the title page will not carry an explicit page number even though they are included in the pre-text page count.

7.3 Post-Text. Post-Text pages up to but not including the appendices will be numbered as a continuation of the text number count.

7.4 Appendices. Appendices will be individually numbered with arabic numerals prefixed by the alphabetic designator for the appendix or the designator "A" if only one appendix is used.

**NAVCOSSACT
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**DOCUMENTATION
PRODUCTION**

NUMBER

20-15

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1

OF

3

1. PURPOSE

This standard establishes standards for paper stock, printing, and binding of NAVCOSSACT documentation.

2. PAPER STOCK

2.1 Cover. Cover stock for all self-covered documents will be 100 lb Antique Finish Cover (JCPL20) and the same size as the document body page (i. e. , 8 X 10-1/2). Stock color will be determined by the classification of the document in accordance with the following table.

<u>Classification</u>	<u>Cover Color</u>
Unclassified	White
Confidential	Green
Secret	Yellow
Top Secret	Pink

2.2 Body Stock. Body stock will be 100 lb Offset Book (JCPA60) in the following sizes.

<u>Size</u>	<u>Purpose</u>
8 X 10-1/2	Individual Sheets
16 X 10-1/2	Single Fold-out
24 X 10-1/2	Double Fold-out

NAVCOSACT STANDARDS	SUBJECT DOCUMENTATION PRODUCTION	NUMBER 20-15	
		PAGE	OF
		2	3

3. PRINTING

3.1 Single Face. Single face printing will be used for documents consisting of 50 masters or less.

3.2 Double Face. Double face printing will be used for documents consisting of more than 50 masters. Right-hand page-faces will be used for, or at the start of, the following:

Special Notices

Revision Sheet

Abstract

Title Page

Table of Contents

List of Illustrations

List of Tables

List of Abbreviations & Symbols

Text Sections

References

Bibliography

Appendices

4. BINDING

The selection of a binding will be based upon the number of sheets in the document and its ultimate use, as given in the following table.

NAVCOSACT STANDARDS	SUBJECT DOCUMENTATION PRODUCTION	NUMBER 20-15	
		PAGE 3	OF 3

<u>Binding Type</u>	<u>Number of Sheets</u>	<u>Purpose</u>
Staples	less than 25	All
Clasp/Post	25-200	Periodic reference
Plastic Comb	25-150	Continuous reference
Looseleaf (unclassified material only)	25-100	Continuous references and update

Documents with a number of sheets in excess of those given for a particular binding type will be bound as a multi-volume set. Page division among the set volumes will be dictated primarily by a logical division of the text. However, the division may not produce more than a 2 : 1 variation in the number of sheets per volume in a multi-volume set.

5. NON-STANDARD PRODUCTION

Certain non-standard documentation, such as machine produced printouts may be required in quantity to accompany standard documentation. In this instance, legible 1 : 1 copies of the original material will be made and bound between hard cover stock for mechanical rigidity. The first sheet of the document will contain a title page similar in format to Figure 1 of STD 20-05. The document will normally be identified as an appendix to a standard document type (STD 10-05).

NAVCSSACT STANDARDS	SUBJECT DOCUMENTATION SECURITY IDENTIFICATION	NUMBER 20-20	
		PAGE 1	OF 6

1. PURPOSE

This standard summarizes the security identification requirements applicable to the preparation of production copies of NAVCOSSACT documentation. For matters of security classification assignment and document handling and control refer to OPNAV Instruction 5510.1B; for matters of document distribution statements refer to NAVMAT Instruction 4000.17.

2. DOCUMENT CLASSIFICATION

Document classification and downgrading notices are the responsibility of the document originator and will be assigned in accordance with the cited OPNAV instruction or direction, as required, from the Security Division (Code 43).

2.1 Document Classification. The classification of a document, which represents the highest classification of material (TOP SECRET, SECRET OR CONFIDENTIAL) appearing in the document will be positioned near the top and bottom of the outside of the front and back covers. The letters of the classification will be capitalized and rendered larger and heavier than the adjacent lettering. Unclassified documents require no marking.

2.2 Page Classification. The classification of a page, which represents the highest classification of material (TOP SECRET, SECRET OR CONFIDENTIAL) appearing on the page will be positioned near the top and bottom of the page. The letters of the classification will be capitalized and rendered larger and heavier than the adjacent lettering.

NAVCOSSACT STANDARDS	SUBJECT DOCUMENTATION SECURITY IDENTIFICATION	NUMBER 20-20	
		PAGE 2	OF 6

2.3 Text Classification. The classification of text will be indicated by the notation: (T) for TOP SECRET, (S) for SECRET and (C) for CONFIDENTIAL and (U) for UNCLASSIFIED immediately to the left of the section, paragraph or subparagraph. Tables and illustrations will be individually classified using the above notations immediately to the left of the table or figure number. Unclassified documents do not require text classification.

2.4 Automatic Downgrading. The appropriate downgrading status of each document will be shown in the lower right corner of the front cover (see STD 20-05, Figure 1). The standard texts to be used are given in Appendix A.

3. DOCUMENT DISTRIBUTION STATEMENTS

Distribution statements appearing on documentation are the responsibility of the document originator and will be assigned in accordance with the cited NAVMAT instruction and assistance, as required, from the Security Division (Code 43). Documents both classified and unclassified are subject to distribution notices. The standard distribution texts to be used are given in Appendix B.

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**APPENDIX A
AUTOMATIC DOWNGRADING NOTICES**

GROUP 1

**EXCLUDED FROM AUTOMATIC REGRADING
DOD DIR 5200.10 DOES NOT APPLY**

GROUP 2

EXEMPTED FROM AUTOMATIC DOWNGRADING BY:

(APPROVING AUTHORITY)
DOD DIR 5200.10

GROUP 3

**DOWNGRADED AT 12-YEAR INTERVALS
NOT AUTOMATICALLY DECLASSIFIED
DOD DIR 5200.10**

GROUP 4

**DOWNGRADED AT 3-YEAR INTERVALS
DECLASSIFIED AFTER 12 YEARS
DOD DIR 5200.10**

NAVCOSSACT STANDARDS	SUBJECT DOCUMENTATION SECURITY IDENTIFICATION	NUMBER 20-20	
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**APPENDIX B
DISTRIBUTION NOTICES**

Statement No. 1

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

If Document is Unclassified:

Statement No. 2

<p align="center"> THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANS- MITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH PRIOR APPROVAL OF (Controlling DOD Office) (fill in) </p>
--

- OR -

If Document is Classified:

<p align="center"> IN ADDITION TO SECURITY REQUIREMENTS WHICH MUST BE MET, THIS DOCUMENT IS SUBJECT TO SPECIAL EXPORT CONTROLS AND EACH TRANSMITTAL TO FOREIGN GOVERNMENTS OR FOREIGN NATIONALS MAY BE MADE ONLY WITH PRIOR APPROV- AL OF (Controlling DOD Office) (fill in) </p>
--

NAVCOSACT STANDARDS	SUBJECT DOCUMENTATION SECURITY IDENTIFICATION	NUMBER 20-20	
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APPENDIX B (Cont'd)

ement No. 3

If Document is Unclassified:

EACH TRANSMITTAL OF THIS DOCUMENT
OUTSIDE THE AGENCIES OF THE U. S.
GOVERNMENT MUST HAVE PRIOR APPROV-
AL OF (Controlling DOD Office)
(fill in)

- OR -

If Document is Classified:

IN ADDITION TO SECURITY REQUIRE-
MENTS WHICH APPLY TO THIS DOCUMENT
AND MUST BE MET, EACH TRANSMITTAL
OUTSIDE THE AGENCIES OF THE U. S.
GOVERNMENT MUST HAVE PRIOR APPROV-
AL OF (Controlling DOD Office)
(fill in)

ement No. 4

If Document is Unclassified:

EACH TRANSMITTAL OF THIS DOCUMENT
OUTSIDE THE DEPARTMENT OF DEFENSE
MUST HAVE PRIOR APPROVAL OF
(Controlling DOD Office)
(fill in)

- OR -

If Document is Classified:

IN ADDITION TO SECURITY REQUIREMENTS
WHICH APPLY TO THIS DOCUMENT AND
MUST BE MET, EACH TRANSMITTAL OUT-
SIDE THE DEPARTMENT OF DEFENSE
MUST HAVE PRIOR APPROVAL OF
(Controlling DOD Office)
(fill in)

NAVCOSSACT STANDARDS	SUBJECT DOCUMENTATION SECURITY IDENTIFICATION	NUMBER 20 20	
		PAGE 6	OF .

APPENDIX B (Cont'd)

Statement No. 5

If Document is Unclassified:

**THIS DOCUMENT MAY BE FURTHER
DISTRIBUTED BY ANY HOLDER ONLY
WITH SPECIFIC PRIOR APPROVAL OF
(Controlling DOD Office)
(fill in)**

- OR -

If Document is Classified:

**IN ADDITION TO SECURITY REQUIRE-
MENTS WHICH APPLY TO THIS DOCU-
MENT AND MUST BE MET, IT MAY BE
FUTHER DISTRIBUTED BY THE HOLDER
ONLY WITH SPECIFIC PRIOR APPROVAL
OF (Controlling DOD Office)
(fill in)**

NAVCROSSACT STANDARDS	SUBJECT DELIVERABLE DOCUMENTS AND MATERIALS	NUMBER 20-25	
		PAGE 1	OF 1

PURPOSE

list the deliverable NAVCOSSACT documents and programming materials.

DELIVERABLE ITEMS

Documentation. Each deliverable package will include a minimum of reproducible master of each programming document produced during project development.

Materials. Each deliverable package will include the materials cited in Paragraphs 2.2.1 and 2.2.2 below.

1 Program Listing. A separate listing of each program on four-part paper as well as a consolidated master listing of all program packages manually in the computer during operation. Utility and Diagnostic routines listed separately. If available, a listing of outputs from test runs should be included.

2 Program Decks and Tapes. A program deck and two tapes will be provided in both symbolic and binary form. The binary deck and tapes will be in a format suitable for immediate use by operating personnel.

NAVCROSSACT STANDARDS	SUBJECT DOCUMENT NUMBERING	NUMBER 1	
		PAGE -	OF 3

1. PURPOSE

To establish the numbering system for NAVCOSSACT programming documentation.

2. DOCUMENT NUMBERING

The document number will be a two-line number. On the first line will be the project number under which the documentation is produced; the second line will contain a control number assigned by the Project Leader to identify the individual documents. The following two-line number is an example of a document number.

NAVCOSSACT DOCUMENT NO.
 90A012
 ODP04A

2.1 Project Number. The alphanumeric identifier for the project assigned per OPNAV Instruction 5230.1A, Appendix B.

2.2 Control Number. The control number consists of the following elements:

- a. **Document Classification.** A sequence of zeros to identify the security level as follows:

Top Secret	000
Secret	00
Confidential	0
Unclassified	(None)

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Document Type. A two-letter mnemonic corresponding to the document type as given in the following table:

	<u>Document Type</u>	<u>Mnemonic</u>
System		
	Preliminary Functional Description	SD
	Data Requirements Document	SR
Design		
	Subsystem Specification	DS
	Program Specification	DP
	Data Base Specification	DB
Manuals		
	Project Manual	MP
	Staff Manual	MS
	Operations Manual	MO
	Program Maintenance Manual	MM
Test		
	Acceptance Test Plan	TP
	Acceptance Test Analysis Report	TR

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- c. Document Type Count. A two digit code starting from 01 assigned from a consecutive count of the documents of the same document type generated on the project.
- d. Document Revision Identification. An alphabetic for each revision starting with A for the first revision.

2.3 Document Number

NAVCROSSACT DOCUMENT NO.
90A012
ODP04A

The above example describes the A revision of the fourth Programming Specification prepared on NAVCROSSACT Project No. 90A012.

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PURPOSE

Establish the procedure for review and approval of NAVCROSSACT producing documentation.

CONDITIONS

Review and approval under this standard will be undertaken when a document is releasable. The document will be in essentially its final form with respect to format and technical content.

TECHNICAL REVIEW AND APPROVAL

A completed document will be distributed for technical review and approval to the originating department. Technical review addressees for each document type are given in Table 1 at the end of this Standard. Review comments will be incorporated in the document and the document, when approved, will be:

- Distributed for general NAVCROSSACT and USER reference per STD 30-15. General distribution following approval at the technical level is only applicable to program design documentation, which requires no further approvals.
- Prepared for NAVCROSSACT-level approval per the following Section 4.

NAVCROSSACT REVIEW AND APPROVAL

A completed document which has received technical approval will be distributed for NAVCROSSACT-level review and approval. NAVCROSSACT review addressees for each document type are given in Table 1. Review comments will be incorporated in the document and the document will be:

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1. PURPOSE

To establish the procedure for review and approval of NAVCOSSACT programming documentation.

2. CONDITIONS

Review and approval under this standard will be undertaken when a document is available. The document will be in essentially its final form with respect to both format and technical content.

3. TECHNICAL REVIEW AND APPROVAL

A completed document will be distributed for technical review and approval within the originating department. Technical review addressees for each document type are given in Table 1 at the end of this Standard. Review comments will be incorporated in the document and the document, will be:

- a. Distributed for general NAVCOSSACT and USER reference per STD 30-15. General distribution following approval at the technical level is only applicable to program design documentation, which requires no further approvals.
- b. Prepared for NAVCOSSACT-level approval per the following Section 4.

4. NAVCOSSACT REVIEW AND APPROVAL

A completed document which has received technical approval will be distributed for NAVCOSSACT-level review and approval. NAVCOSSACT review addressees for each document type are given in Table 1. Review comments will be incorporated in the document and the document will be:

NAVCROSSACT STANDARDS	SUBJECT DOCUMENT REVIEW & APPROVAL	NUMBER 30-10	
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- a. Distributed for general NAVCROSSACT (only) reference per STD 30-15.
- b. Prepared for USER-level approval per the following section.

5. USER REVIEW AND APPROVAL

A completed draft document which has received NAVCROSSACT approval will be distributed for USER-level review and approval. USER addresses for each document type are given in Table 1. Reference distribution of the document will be made to all NAVCROSSACT and USER personnel per STD 30-15.

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APPLICABLE DOCUMENTATION

SYSTEM	DESIGN	MANUALS	TEST
PRELIMINARY FUNCTIONAL DESCRIPTION			
DATA REQUIREMENTS			
SUBSYSTEM SPECIFICATION			
PROGRAM SPECIFICATION			
DATA BASE SPECIFICATION			
PROJECT MANUAL			
STAFF MANUAL			
OPERATIONS MANUAL			
PROGRAM MAINTENANCE MANUAL			
ACCEPTANCE TEST PLAN			
ACCEPTANCE TEST ANALYSIS REPORT			

Addressee

Project Leader
Division Head
Dept. Head

Tech. Dir. (02)
Tech. Asst (02A)
Cmd Sys Off (02P)

Code 80 or OCC
Supporting the User

CNO (CP-35)

USER

KEY: T = Technical Approval
N = NAVCOSACT Approval
U = USER Approval

Note: The above addressees may impose a requirement to review and approve certain documents beyond the requirements stated in Table 1.

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1. PURPOSE

To establish standard distribution lists for programming documentation which is in its final smooth form.

2. DISTRIBUTION LISTS

Distribution lists which include the number of addressee copies are given in Table 1.

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1. PURPOSE

To establish the procedure for executing changes to NAVCOSSACT programming documentation.

2. CONDITIONS AND PROCEDURES

Changes within the scope of this procedure are those made against existing approved documentation, not those in the process of initial preparation.

- a. Conditions. The change can be accomplished within the requirements of the PFD and within the existing project schedule (manpower constant).

Procedures. Initiate a technical review and approval cycle per STD 30-10. No other action required.

- b. Conditions. The change can be accomplished within the requirements of the PFD, but not within the existing project schedule (manpower constant).

Procedures. Assess schedule impact, advise user. As approved, initiate a technical review and approval cycle per STD 30-10.

- c. Conditions. The change cannot be accomplished within the requirements of the PFD but can be accomplished within the existing project schedule (manpower constant).

Procedures. Assess scope impact, advise user. As approved, initiate a sequence of technical, NAVCOSSACT, User review and approval cycles.

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- d. Conditions. The change cannot be accomplished within the requirements of the PFD or within the existing project schedule (manpower constant).

Procedures. Assess total impact, advise user. As approved, initiate a sequence of technical, NAVCROSSACT, User review and approval cycles.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Preliminary Functional Descriptions(PFD). A PFD is normally required for every system developed by NAVCOSACT.

1.2 Scope of Specification

1.2.1 General. Each PFD shall include the information starting with Section 1. GENERAL below in order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable to every system for which a PFD is written and portions not pertinent to a particular system may be designated as not applicable by the Project Leader. (For example, paragraph 2.3.5 on Data Base Magnitude may be eliminated from PFD's for systems which do not process data.)

1.2.2 Reader Orientation. The PFD is a management tool for use by many non-ADP personnel and must be written in non-technical language. It should be oriented toward the non-ADP reader since all elements of the document will be subject to review by non-technical staff personnel.

2. CONTENT OF PFD

The content of the PFD shall be in accordance with the format on the following pages.

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1. GENERAL

1.1 Purpose of Preliminary Functional Description. Paragraph 1.1 shall describe the purpose of the PFD. The description will be in accordance with the following NAVCOSACT objectives for preparation of a PFD:

- a. Provide in writing the system requirements as a basis for mutual understanding between the user and the developer.
- b. Provide a definition of performance requirements and preliminary design.
- c. Define the work to be accomplished.
- d. Provide a basis for the development of system tests.

1.2 Project Reference. Paragraph 1.2 shall state the project title and number and provide a brief summary of the project objectives. This paragraph will also identify the project sponsor and user(s).

1.3 Applicable Documents. Paragraph 1.3 shall provide a list of applicable documents by number and title. This paragraph will include at least the following when applicable:

Project Request
Feasibility Study Documentation
Related Projects' Documentation

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2. SCOPE

2.1 General System Description. Paragraph 2.1 shall provide a general description of the system. It shall include a statement of the type of system, i. e. , functional or support, as well as the general classification of the system such as accounting, inventory control, or command and control for a functional system or compiler, master control, or general utility for a support system. A statement of major performance requirements or goals will also be included if available. The description will also include the designator and title of the organization which will use the system, e. g. , J201-CINCPAC Intelligence Library.

Reference will be made to higher order and parallel systems and their documentation as required to enhance the general description of the system. This paragraph will also include a description of the relationships between the capability being developed and other related capabilities currently under development. When applicable there will be a statement concerning any related events for which this system is required including exercises and impending military operations. The description will also identify anticipated operational changes that will affect the system as well as planned cyclic updating of the system.

2.2 Existing Methods and Procedures. Paragraph 2.2 shall provide a brief description of the methods and procedures presently employed by the originator of the Project Request. Included in the description will be personnel responsibilities, equipment, inputs and outputs, volumes, frequencies, and time delays. This paragraph will include quantitative as well as qualitative values. A System Information Flow Chart (in

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accordance with Standard 50-15) depicting data flow from data acquisition through its processing and eventual output will be provided. If a description of existing methods and procedures is not applicable it may be excluded at the discretion of the Project Leader.

2.3 Proposed Methods and Procedures. Paragraph 2.3 shall provide a description of the proposed system. The description of the proposed system will include a presentation of the proposed capabilities and, if applicable, a comparison with the existing system emphasizing the differences. This paragraph will include a statement of limitations affecting the desired capability including the prediction of expected types of errors. When tools, techniques, and procedures from other systems will be utilized with or will become a part of the proposed system, these will be appropriately presented in this description. A System Information Flow Chart (in accordance with Standard 50-15) will be provided to present an over-all view of the planned capabilities. In addition an Integrated ADP Flow Chart and System Organization Chart will be included in subparagraphs of section 2.3 wherever they best complement the narrative. Paragraph 2.3 may also include a discussion of alternative methods and procedures when appropriate. For example, if the proposed system does not correspond to one required in the Project Request, a discussion of the rationale for the alternative solution and a description of the evaluation criteria may be given.

2.3.1 Summary of Improvements. Paragraph 2.3.1 shall provide a summary of benefits to be obtained from the proposed system. A summation of any deficiencies in the existing system and a summation of additional capabilities required along with appropriate explanations may be

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provided. Explicitly identified will be those capabilities which will be provided by the proposed system. A required capability may be based upon the opportunity to improve existing methods and procedures; if so, the extent of the anticipated improvements will be stated. There will also be explicit identification of any required capabilities which will not be provided by the proposed system including capabilities which are currently being provided by the existing system. Capabilities that are only partially provided will be so stated and appropriately described. This paragraph may also include a comparison of transaction time cycles of the existing and proposed systems. The discussion will include functional improvements (new capabilities), improvements of degree (upgrading existing capabilities), and temporal improvements (decreased response time or processing time).

2.3.2 Summary of Impacts. This paragraph shall describe the anticipated impacts on the existing equipment, software, organizational, and operational environments as well as development impacts.

- a. Equipment impacts will include additions and modifications to the currently available configuration and the operational time requirements to be imposed on the equipment. Reference shall be made in this paragraph to the specific equipment capabilities outlined in paragraph 3.1 of the PFD.
- b. Software impacts will include additions and modifications to existing operational and support software packages necessary to adapt them to the new system.

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- c. Organizational impacts may include modification in positional functions and additional positional functions to implement the new system; both staff and operator functions will be covered. These impacts will include items such as manpower to maintain the data base and manpower to operate and maintain the programs.
- d. Operational impacts will include changes in both staff and operations center procedures to use the new system; considered will be impacts on the relationship of the operations center and the user, impacts on the operational procedures of the operations center, operational similarities with other systems, new data sources, quantity and type of data to be provided, data retentions and data retrieval, reporting intervals, methods of reporting, and modes of operation of the user such as peace time, alert, and wartime. Also included will be recommended methods for providing data.
- e. Development impacts will include estimates of all user requirements necessary to initiate the system such as manpower required to develop the data base and operator and machine time necessary for system test. This paragraph will also identify the requirement to develop conversion programs for modifying existing data files required by the new system.

2.3.3 Specific Performance Requirements. Paragraph 2.3.3 shall describe the specific performance requirements to be satisfied by the system. This presentation will be a delineation of requirements, evolved from the system analysis, on which the system design is to be based. The requirements will be stated in such a manner that system functions

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and system test can be related to them. A quantitative presentation of requirements will be included such as the number of tracks a system is to handle for a functional system or the number of program systems to be supervised by a master control system.

2.3.4 System Functions. Paragraph 2.3.4 shall describe the system functions. This paragraph will show how the aggregate of the system functions satisfy the specific requirements in paragraph 2.3.3. For large projects, this paragraph will relate system functions to appropriate subsystems. For small systems, this paragraph will relate functions to programs where possible.

2.3.5 Data Base Magnitude. This paragraph shall provide an estimate of the number and size of data elements to be included in the system data base. It will provide an enumeration of the different types of data elements by name and size and an estimate of total storage required based on a summation of the requirements for the different types of elements.

2.4 Problem Areas Requiring Further Analysis. Paragraph 2.4 shall provide a description of problems requiring further analysis. For each problem this will include a definition of the problem, the approach to be taken in solving the problem, the anticipated time when the solution will be available, and the impacts on the PFD based on the possible results.

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3. ENVIRONMENT

3.1 Equipment Environment. Paragraph 3.1 shall provide a description of the equipment capabilities required for the system. This paragraph will present descriptions of the equipment presently available and characteristics of any new equipment necessary. A guideline for equipment to be described follows:

Equipment Configuration

Processor(s) including number of each on-line.

Storage media (estimated quantity of core, drum, disk, and tape storage).

Output devices including number of each on-line.

Input devices including number of each on-line.

Communications net including line speeds.

3.2 Software Environment. Paragraph 3.2 shall provide a description of the software environment. There shall be included the correct nomenclature and documentation references of each software system, subsystem, and program with which the subject system will interact. These will include operational and support software. Test software may be included at discretion of the Project Leader. In addition, there will be a description of the program language to be used by the system.

3.3 System Interfaces. Paragraph 3.3 shall provide a description of the interfaces with other systems including systems of other operational functions and other commands as well as interfaces with other internal program systems. For each interface, the following shall be specified:

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Description of operational implications of transfer including security.

General description of data transfer requirements to and from the subject program.

Current formats of interchanged data.

Type of anticipated interface such as manual or automatic.

Anticipated interface procedures.

3.4 Timing. This paragraph shall provide a description of the timing requirements placed on the system, if they are available. The following timing requirements can be considered:

Throughput time.

Response time of major system functions.

Cyclical and temporal relations of functions.

Priorities imposed by types of inputs and changes in modes of operation.

Response time to queries, to threshold values, to parameterized cycles, and to update of data files.

Timing requirements for the range of traffic load under varying operating conditions.

Interleaving requirements for sequencing and interleaving programs and program systems including the requirement for interrupting a program's operation without loss of data.

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3.5 Accuracy. Paragraph 3.5 shall provide a description of accuracy requirements placed upon the system. Each type of system must consider the following items which will be expressed in user terms:

Accuracy requirements of numerical input and output data.

Accuracy requirements of mathematical calculations.

Logical and legal accuracy of alphanumeric data.

Accuracy of transmitted data.

3.6 Security. Paragraph 3.6 shall describe the classified elements of the system including inputs, outputs, or data base. Consideration will be given to the combining of lower classified items to produce a higher classified element. This paragraph will include the level of classification of classes of items, the identification of the classifying agency, and the handling requirements for the classified material. In general, this paragraph will not be applicable to support systems but will be applicable to functional systems.

3.7 Failure Contingencies. Paragraph 3.7 shall provide a description of failure contingencies. There shall be included as appropriate:

- a. The "back-up" technique for insuring achievement of the system function (Para. 2.2.4). "Back-up" as used means the redundancy available in the event the primary system element goes down. A back-up technique for a tape output would be a card output.

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- b. The "fallback" techniques for insuring achievement of the specific requirements of the system. "Fallback" as used means the use of another system or other means to accomplish the system requirements. For example, a manual system would provide a fallback mode for a program system:
- c. The "restart" capability for insuring effective and efficient recovery from a failure. The "restart" capability is a program capability to resume execution of a program from the point in the program at which an interrupt occurred.

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BIBLIOGRAPHY

The bibliography will provide a list of direct and indirect references which are worthy of note by the readers. Each entry will contain Title, Date, Document Number and Classification, Author, and Publisher if applicable. The title of books, papers, reports, and pamphlets, will be underscored; the titles of articles within a publication will be placed in quotation marks. The entries will be arranged alphabetically by author.

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APPENDIX

SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The Appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in the Appendix; these are to be completely defined in the body of the specification. The Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Subsystem Specifications. A subsystem specification is required for each subsystem of a large system that is broken down into two or more subsystems. A subsystem is herein defined as the logical breakdown of a system into separate areas of responsibility, such as functions, where each breakdown is composed of a program or series of programs.

1.2 Scope of Specification.

1.2.1 General. Each Subsystem Specification shall include the information starting with Section 1. GENERAL below in the order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable to every subsystem for which a Subsystem Specification is written and portions not pertinent to a particular subsystem may be designated as not applicable by the Project Leader. The Subsystem Specification may present modifications from the Preliminary Functional Description (PFD), and it should be noted that any modification to the scope of the system effort must be submitted as changes to the PFD in accordance with Standard 30-20.

1.2.2 Reader Orientation. The Subsystem Specification is a technical ADP document prepared for systems personnel. It is to be as detailed as possible concerning the environment and design elements in order to provide maximum guidance to the program design effort. This document also

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defines subsystem inter-relationships. It may be prepared by the Project Leader or subsystems personnel to guide subsystem development. The Subsystem Specification may appear to carry forward excessive redundant material from the PFD; however, it is anticipated that the Subsystem Specification will present more detailed data as a result of the continuing design effort. Furthermore, a Subsystem Specification will only consider those segments of the PFD that are applicable to the particular subsystem.

2. CONTENT OF SUBSYSTEM SPECIFICATION

The content of the Subsystem Specification shall be in accordance with the format on the following pages.

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GENERAL

1 Purpose of Subsystem Specification. Paragraph 1.1 shall describe the purpose of the Subsystem Specification. The description will be in accordance with the following NAVCROSSACT objectives for preparation of Subsystem Specification:

- a. Reflect an intermediate level of requirements to permit independent development of the subsystem.
- b. Communicate details of the on-going analysis to the user operational personnel for their edification, not concurrence.
- c. Allow completion of the PFD by deferring the detailed definition of the subsystem requirements to this document.
- d. Define the inter-relationships among subsystems.

2 Project Reference. Paragraph 1.2 shall state the project title and number and provide a brief summary of the project objectives. This paragraph will also identify the project sponsor and user(s).

3 Applicable Documents. Paragraph 1.3 shall provide a list of applicable documents by number and title. This paragraph will include at least the following when applicable:

Preliminary Functional Description
Related Subsystem Specifications

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2. SCOPE

2.1 Subsystem Description. Paragraph 2.1 shall provide a general description of the subsystem to establish a frame of reference for the remainder of the document. It shall include a summary of the system description in paragraph 2.1 of the Preliminary Functional Description (PFD) as relates to system type, i. e., functional or support, as well as the general classification of the system such as accounting, inventory control, or command and control for a functional system or compiler, master control, or general utility for a support system. The description will also include the designator and title of the organization which will use the system, e. g., J201-CINCPAC Intelligence Library. Reference will be made to paragraph 2.3.4 of the PFD for descriptions of any inter-subsystem function relationships. Also referenced will be the parallel subsystems and their documentation as required to enhance the general description of the subsystem.

2.2 Specific Performance Requirements. Paragraph 2.2 shall describe the specific requirements to be satisfied by the subsystem. These shall be taken directly from the system specific performance requirements enumerated in paragraph 2.3.3 of the PFD and related to the subsystem through paragraph 2.3.4. There will be both qualitative and quantitative descriptions of how the subsystem satisfies the requirements. If a subsystem does not in itself fulfill specific requirements, but is used in conjunction with other subsystems to fulfill requirements, this fact shall be noted in the presentation with a statement showing how the aggregate of subsystems completely satisfies the total requirements.

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2.3 Subsystem Functions. Paragraph 2.3 shall describe the subsystem functions. These shall be taken directly from the system functions enumerated in paragraph 2.3.4 of the PFD. There will be both qualitative and quantitative descriptions of how the subsystem satisfies the functions. If a subsystem does not in itself satisfy system functions, but is used in conjunction with other subsystems to satisfy system functions, this fact shall be noted in the presentation with a statement showing how the aggregate of subsystems completely satisfies the system functions. Although subsystem function descriptions may be refined and more detailed as a result of the on-going analysis and design, they must maintain direct relationship to the system functions, and they must be stated in such a manner that the subsystem environment can be related to them.

2.4 Physical Description. This paragraph shall present the data flow for the subsystem. Charts providing greater detail will be included in Section 4. DESIGN DATA. This paragraph will provide integrated ADP Flow Charts for the subsystem prepared in accordance with Standard 50-15. As a result of the on-going design effort, these charts may differ from the related charts in paragraph 2.3 of the PFD. However, variations from the PFD charts should be explicitly identified.

3. ENVIRONMENT

3.1 Equipment Environment. Paragraph 3.1 shall provide a description of the equipment capabilities required for the subsystem. This paragraph will present descriptions of any new equipment presently available and characteristics of any new equipment necessary. A guideline for equipment to be described follows:

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Equipment Configuration

Processor(s) including number of each on-line.

Storage media (estimated quantity of core, drum, disk, and tape storage).

Input devices including number of each on-line.

Output devices including number of each on-line.

Communications net including line speeds.

Equipment requirements will be related to the requirements stated in paragraph 3.1 of the PFD. Changes in equipment requirements which have occurred since the publication of the PFD as a result of the on-going analysis and design will be explicitly identified and the reasons for the changes will be stated. Changes in the equipment configuration of the user since the publication of the PFD will be discussed in regard to the effects on the subsystem. The descriptions of identified changes will include impacts on the current equipment configuration including additions and modifications to currently available equipments as well as changes to the operational time requirements to be imposed on the equipment.

3.2 Software Environment. Paragraph 3.2 shall provide a description of the subsystem software environment. There shall be included the correct nomenclature and documentation references of each software system, subsystem, and program with which the subsystem will interact. These will include functional and support software. Test software may be included at the discretion of the Project Leader. Software utilized by the System will be related to the requirements stated in paragraph 3.2 of the

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PFD. Changes in the software environment which have occurred since the publication of the PFD will be explicitly identified and the reasons for the changes will be stated. The descriptions of identified changes will include impacts on the currently available software including additions and modifications necessary to adapt the existing software packages to the project requirements.

3.3 Operational Impacts. Paragraph 3.3 shall discuss that portion of paragraph 2.3.2 of the PFD which relates to the subject subsystem. Changes in operational impacts related to the subject subsystem which have occurred since the publication of the PFD will be identified and the reasons for the changes will be stated. This paragraph will include changes to such items as data sources, quantity and type of data to be provided, reporting interval, method of reporting, and recommended methods for providing data.

3.4 Organizational Impacts. Paragraph 3.4 shall discuss that portion of paragraph 2.3.2 of the PFD which relates to the subject subsystem. Changes in impacts related to the subject subsystem which have occurred since the publication of the PFD will be identified and the reasons for the changes will be stated. This paragraph will include changes to such items as modifications in positional functions necessary to implement the new system, manpower to maintain the data base, manpower to operate and maintain the programs, and manpower to effectively use the capability.

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3.5 Subsystem Interfaces. Paragraph 3.5 shall provide a description of the interfaces with other systems including systems of other operational functions and other commands as well as interfaces with other internal subsystems. For each interface, the following shall be specified:

Description of operational implications of transfer including security.

Data transfer requirements to and from the subject subsystem.

Current formats of interchanged data.

Type of interface such as manual or automatic.

Interface procedures.

Interface equipment.

The individual interfaces will be related to that portion of paragraph 3.3 of the PFD which relates to the subject subsystem. Although the interface descriptions may be refined and more detailed as a result of the on-going analysis and design, they must be directly relatable to the interfaces enumerated in the PFD. Changes in interfaces which have occurred since the publication of the PFD will be explicitly identified and the reasons for the changes will be stated. Interface changes effecting changes in scope of the system effort must be submitted as changes to the PFD in accordance with Standard 30-20.

3.6 Timing. This paragraph shall provide a description of the timing requirements placed on the subsystem, if they are available. The following timing requirements may be considered.

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Throughput time.

Response time of major subsystem functions.

Cyclical and temporal relations of functions.

Priorities imposed by types of inputs and changes in modes of operation.

Response time to queries, to threshold values, to parameterized cycles, and to update of data files.

Timing requirements for the range of traffic load under varying operating conditions.

Interleaving requirements for sequencing and interleaving programs and systems including the requirements for interrupting a program's operation without loss of data.

The individual items described above will be related to paragraph 3.4 of the PFD. Changes in timing requirements which have occurred since the publication of the PFD will be explicitly identified and reasons for the changes will be stated.

3.7 Accuracy. Paragraph 3.7 shall provide a description of accuracy requirements imposed on the subsystem. Each type of system must consider the following items which will be expressed in user terms:

Accuracy requirements of numerical input and output data.

Accuracy requirements of mathematical calculations.

Logical and legal accuracy of alphanumeric data.

Accuracy of transmitted data.

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The individual items described above will be related to paragraph 3.5 of the PFD. Changes in accuracy requirements from those stated in the PFD will be explicitly identified and the reasons for the changes will be stated.

3.8 Security. Paragraph 3.8 shall describe the classified elements of the subsystem including inputs, outputs, or data base.

The elements described above will be related to paragraph 3.6 of the PFD. Changes in security requirements which have occurred since the publication of the PFD will be identified and reasons for the changes will be stated.

3.9 Controls. Paragraph 3.9 shall provide a presentation of over-all subsystem controls. Included in this paragraph will be items such as record counts, accumulated counts, batch controls, etc. If no specific controls are to be established at the subsystem level, this will be so stated.

3.10 Flexibility. Paragraph 3.10 shall provide a description of the subsystem flexibility, i. e., ease of adapting to changing requirements. It will include anticipated operational changes, interaction with new or improved systems, and cyclic updating of the subsystem. Identified will be those elements and procedures that will be subject to change. This paragraph is applicable to all types of systems.

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4. DESIGN DATA

4.1 Program Descriptions

4.1.1 Program Description. Paragraphs 4.1.1, 4.1.2, ---4.1.n shall provide descriptions of programs in the subsystem; each program will be described in succeeding paragraphs. A program description will include functions (related to paragraph 2.3), inputs, outputs, and data base. Descriptions for all of the various types of programs (functional or support) will include the information below if applicable.

Inputs - each input will be described as follows:

- a. Title
- b. Format
- c. Number of items
- d. Means of entry and input initiation procedures; e.g., typewriter, card, tape, sensor, internal.
- e. Expected volume and frequency including special handling for high density periods such as queuing and priority handling.
- f. Priority; e.g., routine, emergency.
- g. Sources, form at source, and disposition of source document.
- h. Security classification of input and individual items.
- i. Requirements for timeliness.

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Outputs - each output will be described as follows:

- a. Title
- b. Format to include headings, line spacing, arrangement, totals, etc.
- c. Number of items
- d. Preprinted form requirements.
- e. Means of display; e.g., typewriter, printer, projector, CRT, alarm type, internal.
- f. Expected volume and frequency including special handling for high density periods such as queuing and priority handling.
- g. Priority; e.g., routine, emergency.
- h. Timing requirements; e.g., response time.
- i. User recipients and use of displays such as notification, trends, or briefings.
- j. Security classification of output and individual items.

Data Base - each data file, table or dictionary will be described as follows:

- a. Title
- b. Description of content
- c. Number of records or entries
- d. Storage to include type of storage and address
- e. Classification
- f. Data retention requirements

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4.2 Logical Flow. Paragraph 4.2 shall describe the logical flow of the subsystem. Logical flow will be presented primarily in the form of In/Out Flow Charts and a System Logic Chart (for the subsystem) prepared in accordance with Standard 50-15. Charts will be in sufficient detail to permit program design. A narrative presentation, when appropriate, will be used to supplement the flow charts.

Flow charts will provide an integrated presentation of the subsystem dynamics and will provide entrances and exits as well as interfaces with other programs. Flow charts will effectively represent all modes of operations, priorities, cycles, and special handling. The charts will show data flow from input, through the subsystem to the generation of output.

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SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in the Appendix; these are to be completely defined in the body of the specification. The Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of the Data Requirements Document (DRD). A Data Requirements Document will be prepared at the discretion of the Project Leader when a substantial data collection effort is required.

1.2 Scope of Specification

1.2.1 General. Each Data Requirements Document shall include the information starting with Section 1 GENERAL below in the order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable to every system for which a Data Requirements Document is written and portions not pertinent to a particular system may be designated as not applicable by the Project Leader. In general, utility and support systems do not require user inputs or usage of defined data elements and, therefore, do not require a Data Requirements Document.

1.2.2 Interface with NAVCROSSACT Data Element Library. The Data Requirements Document effort is a complementary effort to the Data Element Library collection. In general, the same basic data element information is required and compatibility of the Data Element Library and the Data Base Requirements is necessary.

1.2.3 Procedures for Data Element Collection. NAVCROSSACT Reports 196 and 197 provide the recommended procedures for Data Element Collection and will be used as the guideline documents.

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1.2.4 Utilization of Data Element Library and Staff. The existing Data Element Library is the source of standard data element information. The use of this Library will facilitate standardization of data elements and enhance NAVCROSSACT's systems capability. NAVCROSSACT Data Element Library personnel will be available to provide assistance in preparation of the Data Requirements Document.

1.2.5 Reader Orientation. The Data Requirements Document is a technical ADP document prepared for both systems and user personnel. It is to be as detailed as possible concerning the definition of inputs required of the user, the procedures to be followed to provide this input to the system, and the description of expected output data along with the systems data limitations.

2. CONTENT OF DATA REQUIREMENTS DOCUMENT

The content of the Data Requirements Document shall be in accordance with the format on the following pages.

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1. GENERAL

1.1 Purpose and Scope of Data Requirements Document. Paragraph 1.1 shall describe the purpose of the Data Requirements Document for the specific system under development. The description will be in accordance with the following NAVCOSACT objectives for preparing a Data Requirements Document:

- a. Specify data elements which the system must handle.
- b. Communicate data requirements to the user for support in the data collection activity.

A description of the type of system being documented shall be given, i.e., support, utility, operations, etc. This shall include a statement of the type of data required by the system. This paragraph shall state in general terms the user support necessary to furnish the required system data for the Data Requirements Document.

1.2 Project Reference. Paragraph 1.2 shall state the project title and number and provide a brief statement of the project objectives. This paragraph shall also identify the project sponsor and user(s). A statement of the relationship of this project to other projects shall be given. Included will be all those projects having interfaces with this system and all those systems of historical significance for this project.

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1.3 Applicable Documents. Paragraph 1.3 shall provide a list of applicable documents by number and title. This paragraph will include at least the following when applicable:

Project Request

Feasibility Study Documentation

Preliminary Functional Description

1.4 Modification of Data Requirements. Paragraph 1.4 shall describe the procedures for implementing and documenting changes to the system data requirements, if applicable.

2. DATA DESCRIPTION

The data described in this section shall be separated into two categories; static data and dynamic data. Static data is defined as that data which is used mainly for reference during system operation and is usually generated or updated in widely separated time frames independent of normal system runs. Dynamic data includes all data which is intended to be updated and which is either input to a system during a normal run or output by the system. (Note: At NAVCOSSACT, static data as described above is frequently referred to as parametric data and dynamic data as non-parametric data.) The data element titles listed in Sections 2.1, 2.2, and 2.3 shall have titles consistent with the Appendix of this document and the NAVCOSSACT Data Element Library to facilitate further data element information reference.

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2.1 Logical Organization of Static System Data. This paragraph shall provide a listing of those static data elements used by the system for either parametric control or reference purpose. The data elements will be arranged alphabetically, by title. A further breakdown of data elements according to functions, subjects, or other categorizations which are most relevant to their usage may be made at the discretion of the Project Leader. However, within each category the data element titles will be arranged alphabetically, by title.

2.2 Logical Organization of Dynamic Input Data. This paragraph shall provide a listing of those dynamic input data elements which constitute the data that is intended to be updated by a normal system run or during on-line operation. The data elements will be arranged alphabetically, by title. A further breakdown of data elements according to functions, subjects, or other categorizations which are most relevant to their usage may be made at the discretion of the Project Leader. However, within each category the data element titles will be arranged alphabetically, by title.

2.3 Logical Organization of Dynamic Output Data. This paragraph shall provide a listing of those dynamic output data elements which constitute the data that is intended to be updated and output by a normal system run or during on-line operation. The data elements will be arranged alphabetically, by title. A further breakdown of data elements according to functions, subjects, or other categorizations which are most relevant to their usage may be made at the discretion of the Project Leader. However, within each category the data element titles will be arranged alphabetically, by title.

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2.4 Internally Generated Data. Paragraph 2.4 shall provide an alphabetical listing of internally generated data which is of interest to the user. The selection of elements to be included in this paragraph will be at the discretion of the Project Leader since they will only be of informational value to the user and will require no action by the user.

2.5 System Data Constraints. Paragraph 2.5 shall state all the known or anticipated system data constraints at this phase of the system's development. This information will be a general indication of the limits of this system with regard to future expansion or utilization. This shall be a statement of the maximum size and the maximum number of files, records, and elements. Emphasis shall be placed on limits which could prove critical in future systems development.

3. USER SUPPORT REQUIRED FOR DATA COLLECTION

All of the data elements required for the system will be defined in Paragraphs 2.1, 2.2, and 2.3. Section 3 will describe the data collection support from the user required to establish the data values necessary to support the particular system.

3.1 Data Collection Requirement. Paragraph 3.1 shall describe the information required for establishing the system data values of each element. It shall state that each data element will be, as a minimum, described in accordance with the information required for the Data Element Library. In addition, the Project Leader may require the following supplementary information:

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- a. **Input Source(s) of the Data Element.** This item names the source(s) from which the data element will be fed into the system. The source, or origin, of the data, will be an operator, station, organization unit, etc. or groups thereof; not the hardware device used for entering the data. An exception can be made in the case of automatic sensor devices, but in this case, the device should be linked to another data element set such as vehicle carrying the device, organization responsible for its use or maintenance, geographic location, etc.
- b. **Input Medium.** This item names the hardware device used for entering the data into the system. In those cases where only certain special stations are the legal entry points, those discrete devices shall be specified.
- c. **Recipients.** The item specifies those users (other than the originator) who should be cognizant of the data. This applies in the following cases:

Data elements input to the system, processed by it, and output by it essentially unchanged.

Data elements generated by a program and output to the user.

Data elements input to the system but which do not get output by it. In this case, the program would substitute for the user as the recipient.

- d. **Critical Value.** Many data elements that have a range of values will have one value that is particularly significant to the user. This may be a breakpoint, a minimum stock level, a critical wind velocity, etc. When applicable, the critical value and its significance to the user should be included in the definition.

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- e. **Increment of Measurement.** If the successive steps on the measurement scale (the gauge) are not equal to "one" on the units of measurement, then the increment used shall be specified. For example, a data element representing pounds of pressure per square inch (the unit of measurement) may be incremented at pound, half-pound, or ten-pound intervals.
- f. **Conversion Factors.** Measured quantities that must go through analog and digital conversion processes shall have the conversion factors specified.
- g. **Output Form/Device.** Output data elements may be presented to the user symbolically, graphically, or audibly. The definition should specify whether the user will receive this data element as part of a hard-copy printout, a character in a CRT display, a line on a drawing, a colored light, an alarm bell, etc.
- h. **Expansion Factors.** For systems that are expected to undergo future expansion, it is prudent to include an expansion factor to be added to the maximum number of entries of this data element. For instance, if the maximum number of input devices is now 12, but is expected to be 96 three years from now, the 800% expansion factor should be specified.
- i. **Frequency of Update.** Data elements that are input to the system or that are expected to be modified by the system on a periodic basis should have the frequency of update specified.

3.2 Scope of Data Collection. Paragraph 3.2 shall specify the specific information to be collected by the user. These shall be logically grouped and presented in a manner which will enable the user to make an effective response.

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3.3 Recommended Source of Input Data. Paragraph 3.3 shall delineate the source(s) of input data. Recommendation as to who shall be responsible for providing specific data inputs shall be stated here. This shall include recommendations regarding the establishment of a user input reporting organization if required. Those data inputs dependent on interfacing systems, unrelated agencies, or specific documents should be stated and the source defined.

3.4 Data Collection and Transfer Procedures. Specific instructions for data collection procedures shall be given in Paragraph 3.4. These instructions shall include detailed formats where applicable. Communications media and timing of inputs shall be stated also.

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The Appendix of the Data Requirements Document shall be in alphabetical (by title) listing of all the data elements of this system. Each element shall be defined in accordance with the NAVCROSSACT Data Element Library standard and shall follow the format specified in NAVCROSSACT Report 196. The Appendix shall include appropriate cross referencing to the listings in Sections 2.1, 2.2, and 2.3.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Program Specifications. A Program Specification is required for each program in every system developed by NAVCOSACT.

1.2 Scope of Specification

1.2.1 General. A Program Specification may include all or portions of the information starting with Section 1 GENERAL below in the order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable for every Program Specification written since the document may be used to provide general guidance to the programmer to permit program development, or it may be used to provide all the details necessary to allow coding from the contents of the document. Portions not pertinent to a particular program may be designated not applicable by the Project Leader. The Program Specification may present modifications from the Preliminary Functional Description (PFD), and it should be noted that any modification to the scope of the system effort must be submitted as changes to the PFD in accordance with Standard 30-20.

1.2.2 Reader Orientation. The Program Specification is a technical ADP document. The amount of detail to be included is dependent upon the use to be made of the document within the particular project for which it is prepared. It may be prepared by the Project Leader, systems analyst, or programmer to guide program development. The Program Specification

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will provide some redundancy with the PFD and the related Subsystem Specification when one is prepared; however, it is anticipated that the Program Specification will present more detailed data as a result of the detailed program design effort. Furthermore, a Program Specification will only consider those segments of a PFD or Subsystem Specification that are applicable to the particular program.

2. CONTENT OF PROGRAM SPECIFICATION

The content of the Program Specification shall be in accordance with the format on the following pages.

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1. GENERAL

1.1 Purpose of Program Specification. Paragraph 1.1 shall describe the purpose of the Program Specification. The description will be in accordance with the following NAVCROSSACT objectives for the preparation of a Program Specification:

- a. Describe the program design to permit program production by the programmer/coder with sufficient detailed information so that the design ultimately may be translated into instructions.
- b. Provide a permanent record of the detailed operation of the program.

1.2 Project Reference. Paragraph 1.2 shall state the project title and number and provide a brief summary of the project objectives. This paragraph will also identify the project sponsor and user(s).

1.3 Applicable Documents. Paragraph 1.3 shall provide a list of applicable documents by number and title. This paragraph will include at least the following when applicable:

Preliminary Functional Description
Associated Subsystem Specification
Related Program Specifications

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<p>2. SCOPE</p> <p>2.1 Program Description. Paragraph 2.1 shall provide a general description of the program to establish a frame of reference for the remainder of the document. The system description in paragraph 2.1 of the PFD may be referenced. Also referenced will be the parallel programs and their documentation as required to enhance the general description of the program. If the program is common to more than one subsystem or system, appropriate references will be made to the applicable Subsystem Specifications and PFD's.</p> <p>2.2 Program Functions. Paragraph 2.2 shall describe the program's functions. These shall be taken directly from those portions of the subsystem functions (Paragraph 2.3 of the Subsystem Specification) or the system functions (Paragraph 2.3.4 of the PFD) which apply to the subject program. The functions of the program may be described in relation to the specific requirements they satisfy if this information will enhance a description of the functions. The specific requirements may be taken directly from the subsystem requirements (Paragraph 2.2 of the Subsystem Specification) or system requirements (Paragraph 2.3.3 of the PFD) which apply to the subject program. There will be both qualitative and quantitative descriptions of how the program satisfies the functions. If a program does not in itself satisfy system or subsystem functions, but is used in conjunction with other programs to satisfy system or subsystem functions, this fact shall be noted in the presentation with a statement showing how the aggregate of programs completely satisfies the functions. Although the</p>			

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function descriptions may be refined and more detailed as a result of the on-going analysis and design, they must be directly related to the subsystem or system functions and they must be stated in such a manner that program environment can be related to them.

3. ENVIRONMENT

3.1 Program Requirements. Paragraph 3.1 shall provide a description of general program requirements, e.g., character code configuration (Baudot; BCD, Fieldata, Hollerith; etc), fixed or floating point arithmetic, and character code formats (number of bits; least significant bit first or last).

3.2 Equipment Environment. Paragraph 3.2 shall present descriptions of the equipment used by the subject program to include only the correct nomenclature, special features not implied by this nomenclature, and the number presently available of each type of equipment. Equipment requirements will be related to the requirements stated in paragraph 3.1 of the Subsystem Specification or the PFD. Changes in equipment requirements which have occurred since the publication of the next higher order document will be identified and justified. The descriptions of identified changes will include impacts on the current equipment configuration including additions and modifications to currently available equipment as well as changes to the operational time requirements to be imposed on the equipment.

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3.3 Software Environment. Paragraph 3.3 shall provide a description of the program software environment. There shall be included the correct nomenclature and documentation references of each software system, subsystem, and program with which the program will interact. These will include operational and support software. Test software may be included at the discretion of the Project Leader. In addition, there will be a description of the programming language to be used by the program. Changes in the software environment which have occurred since the publication of the Subsystem Specification or the PFD as a result of the ongoing analysis will be explicitly identified and the reasons for the changes will be stated. The descriptions of identified changes will include impacts on the currently available software including additions and modifications necessary to adapt the existing software to the subject program.

3.4 Operational Impacts. Paragraph 3.4 shall discuss that portion of paragraph 3.3 of the Subsystem Specification or of paragraph 2.3.2 of the PFD which applies to the subject program. Changes in operational impacts related to the program which have occurred since the publication of the Subsystem Specification or the PFD will be identified and the reasons for the changes will be stated. This paragraph will include changes to such items as data sources, quantity and type of data to be provided, reporting interval, method of reporting, and recommended methods for providing data.

3.5 Organizational Impacts. Paragraph 3.5 shall discuss that portion of paragraph 3.4 of the Subsystem Specification or Paragraph 2.3.2 of the PFD which applies to the subject program. Changes in organizational impacts related to the program which have occurred since the publication

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of the Subsystem Specification or the PFD will be identified and the reasons for the changes will be stated. This paragraph will include changes to such items as modifications in positional functions necessary to implement the new system, manpower to maintain the data base, manpower to operate and maintain the programs, and manpower to effectively use the capability.

3.6 Program Interfaces. Paragraph 3.6 shall provide a description of the interfaces with other programs including programs of other operational functions and other commands as well as interfaces with other internal programs. For each interface, the following shall be specified:

Description of operational implications of transfer including security.

The data transfer requirements to and from the subject program (data content, sequence, timing, format, volume, and processing).

Formats of interchanged data.

Data conversion requirements.

Type of interface such as manual or automatic.

Interface equipment.

Interface procedures.

The individual interfaces will be related to that portion of paragraph 3.5 of the Subsystem Specification or paragraph 3.3 of the PFD which relates to the subject program. Changes in interfaces which have occurred since the publication of the next higher order document will be explicitly identified and the reasons for the changes will be stated.

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3.7 Timing. This paragraph shall provide a description of the timing requirements placed on the program. The following timing requirements may be considered:

Throughput time.

Response time of major program functions.

Cyclical and temporal relations of functions and data flows.

Priorities imposed by types of inputs and changes in modes of operation.

Response time to queries, to threshold values, to parameterized cycles, and to update of data files.

Timing requirements for the range of traffic load under varying operating conditions.

Interleaving requirements for sequencing and interleaving programs and systems including the requirements for interrupting a program's operation without loss of data.

I/O transfer time required - disk, drum, tape.

Internal processing time.

The individual items described above will be related to that portion of paragraph 3.6 of the Subsystem Specification or paragraph 3.4 of the PFD which relates to the subject program. Changes in timing requirements from the next higher order document will be explicitly identified and justified.

3.8 Accuracy. Paragraph 3.8 shall provide a description of accuracy requirements placed upon the program. Each type of program must consider the following items:

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Accuracy requirements of numerical input and output data.

Accuracy requirements of mathematical calculations.

Logical and legal accuracy of alphanumeric data.

Accuracy of transmitted data.

This paragraph will designate techniques such as parity transmission to be utilized to insure meeting the specified accuracy requirements.

The items described above will be related to that portion of paragraph 3.7 of the Subsystem Specification or paragraph 3.5 of the PFD which relates to the subject program. Changes in accuracy requirements from the next higher order document will be explicitly identified and the reasons for the changes will be stated.

3.9 Storage. Paragraph 3.9 shall provide a description of storage requirements for the program. Included shall be internal storage requirements and use of homogeneous core and auxiliary storage - tape, disk, drum - with the estimated quantity of storage required for each. Each type of program must give consideration to the following types of information for the various storage media:

Core storage; no. of words/core bank; no. of banks.

Drum storage; no. of words/field; no. of fields/drum; no. of drum assemblies.

Disk storage; no. of words/zone; no. of zones/disk; no. of disks/disk unit; no. of disk units.

Tape storage; no. of adapters; no. of tape drives/adapter; no. of tapes.

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In addition, the machine storage will be further allocated into permanent and temporary areas.

3.10 Security. Paragraph 3.10 shall describe the classified elements of the program including inputs, outputs, and data base. The individual elements described above will be related to paragraph 3.8 of the Subsystem Specification or paragraph 3.6 of the PFD and any changes will be described and justified.

3.11 Controls. Paragraph 3.11 shall provide a presentation of any program controls. Included in this paragraph will be items such as record counts, accumulated counts, batch controls, etc. If no specific controls are to be established at the program level, this will be so stated. The controls described above will be related to that portion of paragraph 3.9 of the Subsystem Specification which relates to the subject program.

3.12 Flexibility. Paragraph 3.12 shall provide a description of the program flexibility, i. e., ease of adapting to changing requirements. It will include anticipated operational changes, interaction with new or improved programs, and cyclic updating of the program. Defined also will be those elements and procedures that will be subject to change. This paragraph will be related to the portions of paragraph 3.10 of the Subsystem Specification that are applicable to the subject program.

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4.1 Terminal Procedures. Paragraph 4.1 shall provide a description of the system terminal procedures. There will be a description of the load,

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start, stop, and restart procedures. The special program requirements necessary for the implementation of these terminal functions shall be delineated. There shall also be defined the communication requirements for all programs with the executive or control program. In addition, Program Specifications for executive or control type support programs for multiprocessor systems will include processor switchover procedures.

4.2 Inputs. Paragraph 4.2 shall provide a detailed description of all program inputs. There shall be a description of each type of input applicable to the program. Each input shall be categorized by type and described in detail to include the following as applicable:

- a. Title and tag.
- b. Format.
- c. Number of items.
- d. Description of each item to include number and type of characters (numeric, alpha, decimal, signed, unsigned), range of values, accuracy requirement.
- e. Means of entry and initiation procedures; e.g., typewriter, card, tape, sensor, internal.
- f. Length of input including special handling requirements due to variations in length.
- g. Expected volume and frequency including special handling for high density periods such as queuing and priority handling.
- h. Priority; e.g., routine, emergency.
- i. Sources, form at source, and disposition of source document.

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- j. Disposition other than processing such as logging, retention in input form, hard copy reproduction of input, storage location, and custodian.
- k. Security classification of input.
- l. Flexibility such as capability of omitting and adding items.
- m. Requirements for timeliness.
- n. Throughput time.
- o. Special handling such as specification of special control cards.

This paragraph shall include examples of prepared inputs and user interfaces such as input creation sheets and message forms.

4.3 Outputs. Paragraph 4.3 shall provide a detailed description of all program outputs. There shall be included a description of each type of output applicable to the program. Each output shall be categorized by type and described in detail to include the following as applicable:

- a. Title and tag.
- b. Format to include headings, line spacing, arrangement, totals, etc.
- c. Number of items.
- d. Description of each item to include number and type of characters (alpha, numeric, symbol, etc.), range of values, accuracy requirement, supporting background information to be presented (e.g., maps).
- e. Data selection criteria will be presented to establish the basis for selecting information for display; e.g., selection for a maintenance report may be on the basis of active records in a file of aircraft type and aircraft usage.

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- f. Description of plots or graphic displays will include the coordinates to be used, symbols to be used, type of graphic technique (i. e., point or continuous), number of curves per sheet, etc.
- g. Preprinted form requirements.
- h. Means of display, e. g., typewriter, printer, projector, CFT, alarm type, internal.
- i. Length of output including special handling requirements due to variations in length.
- j. Expected volume and frequency including special handling for high density periods such as queuing and priority handling.
- k. Priority; e. g., routine, emergency.
- l. Timing requirements; e. g., response time.
- m. User recipients and use of displays such as notification, trends, or briefings.
- n. Disposition including logging, film and hard copy printout reproduction and storage, numbers of copies required for distribution, place of storage, person responsible for permanent copy, retention period, and special handling required because of bulk, classification, timing.
- o. Security classification of output.
- p. Throughput time.
- q. Explanation of symbols.
- r. Conditional and/or status indicators (code and condition definition).

Included in this paragraph shall be examples of program outputs.

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4.4 Data Environment. Paragraph 4.4 shall provide a description of the data environment of the program. There shall be included descriptions of the files, tables, dictionaries, program inter-relationship with the tables, storage allocation, intermediate data structures, and data retention requirements. A compool structure may be defined here if the program is compool oriented. This paragraph does not replace the requirement for the development of separate data base documentation which has different objectives from this specification. Each file, table, or dictionary will be described in detail to include the following when available:

- a. Title and tag.
- b. Description of content.
- c. Parameters - start of file, end of file.
- d. Number of records or entries.
- e. Record parameters - start of record, end of record.
- f. Compool status of each record.
- g. Storage to include type of storage and address.
- h. Normal order of the file and other orders required for special purposes.
- i. File classification.

Storage allocation will be described for core and auxiliary storage as follows:

- a. Storage media.
- b. Available storage on each medium.
- c. Addresses of available storage.
- d. Erasable working storage.

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Data retention requirements will be described as follows:

- a. Historic retention to include collection of data to be retained, format, storage medium, and time parameters.
- b. Periodic report data; e.g., time retained after report and time retained for summary reports.
- c. Summary report data such as time retained after summary report.

Program inter-relationship with data base will be described to show files and tables used in each program function.

4.5 Logical Flow. Paragraph 4.5 shall describe the logical flow of the program. Logical flow will be presented primarily in the form of charts prepared in accordance with Standard 50-15. A narrative presentation, when appropriate, will be used to supplement the flow charts. A Program Specification will include a System Logic Chart (that portion pertaining to the program). Additional charts will be included, such as Program Logic Chart and Coding Logic Chart, if needed to support the use to be made of the document. All program charts will be keyed to the higher order charts in the Subsystem Specification (if applicable) or the system PFD. The logical flow shall provide a detailed description of the processing performed by the program. There shall be included for each program function noted in paragraph 2.2 a description of program operation. All processes will be described to include algorithmic logic, data manipulations, and decision processes involved. Conditions being tested for purposes of branching will be explained in detail, as well as methods for identifying error

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conditions and resulting actions by the program. The charts and narrative will be related to the information in paragraph 4.2 of the Subsystem Specification (if applicable). Although the data will be more detailed, it must be relatable to the higher order documentation. Changes in logical flow which have occurred will be explicitly identified and reasons for the changes stated.

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APPENDIX A

SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The Appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in the Appendix; these are to be completely defined in the body of the specification. The Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs. The individual terms will be in consonance with the usage in the other documentation of the system.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Data Base Specifications by a computer system developer when required as a part of a NAVCOSSACT project. It is applicable to all projects.

1.2 Scope of Specification

1.2.1 General. Each Data Base Specification shall include information starting with Section 1 GENERAL below in the order presented and under the paragraph titles specified. All paragraphs are not applicable to every system for which a Data Base Specification is written and portions not pertinent to a particular system may be designated not applicable by the Project Leader.

1.2.2 Reader Orientation. The Data Base Specification is a technical ADP document prepared for programmers. It is to be sufficiently detailed to permit program coding and data base generation by the developer.

1.2.3 Formats. Since the information contained herein is intended to cover all types of program systems, this document does not make specific formats mandatory. It is presumed that the system developers on any given system are best qualified to devise the physical formats most useful and most easily comprehensible to the project personnel. However, to achieve a consistency of documentation most beneficial to all personnel, the following rules are presented:

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- a. In all Data Base Specifications, the order of information given in this document shall be followed.
- b. In all Data Base Specifications, each formatted presentation of information shall be followed by an explanation of the formatted arrangement.
- c. In all Data Base Specifications, each item of information shown in a formatted presentation shall be clearly labelled.

1.2.4 Criteria for Listings. In general, all listings should be alphabetically arranged because of the universal acceptance of this logical arrangement of information. Other logical arrangements are acceptable only when their advantages over the alphabetical arrangements are evident and the logical criteria are obvious. For instance, in this document, program entities are categorized from largest to smallest; storage listings are arranged by storage media.

2. CONTENT OF DATA BASE SPECIFICATION

The content of the Data Base Specification shall be in accordance with the format on the following pages.

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1. GENERAL

1.1 Purpose of the Data Base Specification. Paragraph 1.1 shall describe the purpose of the Data Base Specification. The description will be in accordance with the following NAVCROSSACT objectives for the preparation of a Data Base Specification:

- a. Describe storage allocation and data base organization.
- b. Provide the basic design data necessary for the construction of the system files, tables, and dictionaries.

1.2 Project Reference. Paragraph 1.2 shall reference the project title and number and provide a brief summary of the project objectives. This paragraph will also identify the project sponsor and user(s).

1.3 Applicable Documents. Paragraph 1.3 shall provide a list of applicable documents by number and title. This paragraph will include at least the following when applicable:

Preliminary Functional Description

Subsystem Specifications

Program Specifications

Data Requirements Document

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2. DATA BASE IDENTIFICATION AND DESCRIPTION

This section shall provide all of the information necessary to identify and describe the data base being documented. It shall, in addition, contain various kinds of background information essential for the proper utilization of the data base.

2.1 Data Base Identification. This paragraph shall give the code name, tag, or label by which each data base may be uniquely identified. Additional textual information shall also be given, whether or not it is implied in the identification code.

2.1.1 Unique Identification. The data base code or label shall be stated.

2.1.2 System(s) Using the Data Base. The system of which this data base is a part shall be accurately and thoroughly identified. Included shall be the full system name, system code name, tag, or label, and system model, modification, or version number. If more than one system uses this data base, then each of them shall be identified in the above manner.

2.1.3 Effective Dates. The first and last dates of the period during which this data base may be used with the above named system shall be given. The basis of the selection of the dates may vary. They may correspond to document publication dates, program testing periods, turnover periods, turnover or delivery dates, etc., depending upon the implementation plan being used for the system. This paragraph shall also indicate whether the data base is complete or incomplete, pre- or post-system delivery to the customer, experimental or permanent, supersedes or will be superseded by another data base.

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2.1.4 Physical Description of Data Base Files. The physical characteristics of the Master Data Base File(s) and duplicate working copies shall be given. This paragraph shall include the file media (card decks and/or tapes), form of the file (symbolic and/or binary, and the respective codes used).

2.2 Tagging Conventions. This paragraph shall discuss the system tagging conventions to the extent necessary for the programmer to use the conventions as a practical working tool.

2.3 Organization of the Data Base. Paragraph 2.3 shall provide system implementers with a single, central source of major design considerations for the handling of the data base. The purpose of this paragraph is to promote consistency of design concerning the organization and manipulation of the physical data base files.

The following information shall be given for each kind of storage medium containing the data base files:

- a. General file design and format.
- b. Rationale of the design.
- c. Illustrative specific examples.

An extensive example of the kind of information to be presented in this paragraph is shown below. A comparable decimal breakdown shall be provided for each storage medium.

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2.3.1 Tapes

2.3.1.1 System Master Program Tape (PMASTR--)

- a. **File Design and Format.** The System Master Tape contains three tape files as shown below.

File #1

Tape ID Label
(PMASTR--)

EOF

File #2

Directory of
Programs in File #3

EOF

File #3

Program File
2 Records per Program
as follows:

Program "A" control data

Program "A"

Program "B" control data

Program "B"

Etc.

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- b. **Design Rationale.** All system tapes will contain an identification label as the first tape file. All tape loading programs will check the labels against tape identification parameters input when the system is initialized.

The second tape file contains the tags of all programs in the third file in their sequential order, plus a core/peripheral storage indicator. The loader program uses this to locate programs on the tape and to construct a program storage directory table in core.

The third tape file contains 2 records per program. The first contains detailed storage data about the program; the second contains the binary program itself. The tape loader moves the programs to their assigned peripheral storage areas, and places the contents of the storage records into the permanent storage directory maintained in core.

- c. **Examples.** Not applicable for this tape (in this example, the organization of this physical tape file was explained sufficiently in a. and b. above).

2.4 Special Instructions. This paragraph shall contain the instructions to be followed by all personnel who will contribute to the compilation of the data base and who will use it for both testing and operational purposes. It will contain information such as:

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- a. Criteria for making data a part of the data base.
- b. Rules and procedures to be followed when submitting data for entry into the data base.
- c. Identification of a data control unit, if applicable.
- d. Formats for data description sheets and cards.
- e. Machine run instructions for compiling, modifying, updating, or otherwise using the data base files. In very large systems, where the details of such instructions are extensive, this paragraph may reference sections of other programming documents (manuals or specifications) where this specific information can be found.

2.5 Utility Tools Available for Handling the Data Base. In this paragraph, all of the utility and support programs directly related to the data base shall be either referenced or, if required, discussed briefly. Descriptions shall include program name, functions, and major program operating considerations, such as operating time, hardware setup required, etc. The detailed program specification shall also be cited. If only referenced, then program name, document title, document number, and appropriate sections of the document shall be provided. Examples of such programs are:

Assemble Compool Program

Data Base (or Compool) Analyzer Programs

Storage Allocator Program

Set/Used Data Analyzer Program

Data Base Loader Program

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Also to be included will be EAM procedures created specifically to handle the data base. These may include procedures such as card sorts, card-to-tape makeup, and tape-to-printer listings.

3. DATA DEFINITIONS

This section shall include thorough, detailed definitions and descriptions of all of the forms of data utilized by the system. The specific details of information required for each form of data may vary from system to system and will depend on the design characteristics of the operational and/or machine operating systems. The information specified below is intended to cover all kinds of systems, it is not intended to be totally applicable to any system. However, the Data Base Specification for a given system shall include all of the information applicable to that system in the order discussed below.

3.1 Program Entities. This paragraph shall list program entities defined for the system. They shall proceed from the largest program entity to the smallest, as shown below in 3.1.1 through 3.1.5.

3.1.1 Program Subsystems. This listing shall include all largest-order program groupings, such as operational, simulator, utility, and machine operating subsystems. Descriptive details shall include:

Subsystem tag or identification code.

Name (in full).

Function (describe briefly).

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Estimated or actual total size.

Storage media required, plus amount required of each medium and, when applicable, actual areas of each medium that will be occupied by the subsystem.

If the subsystem is used in more than one system, a list of all systems using it.

Major operating characteristics; e.g., real time or not, self-operating or under executive control, has exclusive use of machine or time-shares it, required and optional hardware, operating limits and constraints.

A list of all next lower-order program components.

3.1.2 Program Functional Areas. Large systems may have large groups of programs that are related to broad operational or machine functions.

The system design may provide a clear-cut definition of a program entity to correspond to each broad function. Examples of such logical program groups are those that perform message input, message output, inventory, payroll, equipment simulation, tracking and intercept, data preparation, file update, information retrieval, and restart and recovery. Information required to define such functional areas is similar to that required for a program subsystem and shall include:

Area tag or identification code.

Name (in full).

Function (describe briefly).

Size and storage media requirements.

Subsystem(s) the area serves.

Major conditions or parameters for area operation.

A list of all next lower-order program components.

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3.1.3 Programs Plus Environment Groupings. This category of data may be included in the design of systems where blocks of core or peripheral storage files contain a mix of programs and tables that are operated as a single entity. The word "task" has been used for such logical groupings that perform specific functions; e. g. , message interpretation, display generation, program sequence control (an executive function), and program compilation. Descriptive information for this program entity shall include:

Logical group tag or identification code.

Name (in full).

Specific function (describe briefly).

Parent subsystem.

File(s) in which it is located.

Storage media requirements.

Storage location of this task's directory, parameters, or control table(s).

Lengths of shortest and longest programs.

Lengths of shortest and longest tables.

Tags of programs that are entry points for the task.

Tag of last program to operate.

Coded task termination conditions with the tags of the item(s) and table(s) where found.

List of programs included in the task.

List of tables included in the task (each program and table listed should also carry an indication as to whether or not it is used exclusively by this task).

Major conditions for task operation.

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3.1.4 Programs. Each program in a system shall be described by the following:

Program tag or identification code, including its model or version number.

Program name (in full).

Brief statement of program's purpose.

Parent subsystem indicator, followed by other subsystems it serves, if applicable.

Parent task, other tasks using the program, if applicable.

File location(s) for master symbolic and/or binary card decks and tapes.

Estimated or actual program size.

Peripheral and core storage areas and indication of permanent or temporary occupancy of core.

Operating mode of system when this program is operated; e.g., normal, emergency, initialization, etc.

Frequency of operation (depending upon the purpose and design of the particular system, this item may contain "once," "as required," "every cycle," "following Program XXX," or similarly descriptive terms).

Program entry and exit points (internal tags, relative or absolute addresses).

Coded entrance and exit conditions.

Location or items containing entrance and exit conditions.

Tables used by this program, with indication as to whether or not the table is for exclusive use of this program.

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3.1.5 Subroutines. This paragraph shall list all subroutines available for use by the system's programs. Information shall include:

Subroutine tag or identification code.

Name (in full).

Function (describe briefly).

Size.

Open or closed subroutine indicator.

Subroutine library file : ame and location, if applicable.

3.2 Data Files. A data file is a logical arrangement of information. However, even within a given system, the diverse data files usually vary so widely in their logical arrangements, forms, formats, and physical media that no over-all rules of composition or conventions apply to their construction. There is only one rule that need apply to all data files: they must all bear the same kind of tag or label that identifies them as files and not some other kind of logical arrangement of data. Because of the flexibility in data file construction and utilization, each one should be defined as explicitly as possible. Information shall include:

File tag or label.

Name (in full).

A brief statement of the file's purpose, utilization, and logical criteria used for the file's compilation.

The largest program entity using the file.

Primary and secondary storage media.

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File contents (depending upon the complexity and size of the file, this may vary from a listing of each record of the file to the broad or generic categories of information contained therein).

The form of the contents (symbolic, binary, mixed).

Conditions for modifying or updating the file.

Method of modifying or updating the file.

Restrictions and limitations on usage.

Explicit file format.

File control information used by programs, such as storage control records, directories, pointers, and continue, skip, and end-of-file markers.

Graphic representation of file structure.

3.3 Tables. An adequate table definition shall contain the following information as applicable:

Table tag.

Full name and/or purpose of the table.

Data file containing the table.

Super-table or data block containing the table.

Subsystem that uses this table.

Logical divisions within table (internal table blocks or parts - not entries).

Basic table structure (fixed or variable length, fixed or variable entry structure).

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If fixed table:

Number of words per entry.

Number of entries in table.

If variable table:

Maximum length (number of words).

Maximum number of entries (if entry structure is fixed).

Number of kinds of entries.

Key and control items of each kind of entry.

Indication of presence or absence of table control words
(table heading).

Peripheral and core storage addresses.

Other directly related tables plus a statement of the relationship.

Example: Table SRCH0, item LOOKUP contains the entry
type code for the first entry in this table.

Details of the structure of each entry type to include:

Graphic representation of each entry type.

Tag of each item plus its entry word number and bit positions.

Unique or significant characteristics such as:

"To-be loaded into hardware protected registers only."

"Contents adapted to each installation (for a multi-site
system)."

"Use of this table illegal except under emergency mode of
operation."

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3.4 Items. As used in this paragraph, the word "item" refers to a specific category of detailed information that has a defined position within a table, and that is coded for direct and immediate manipulation by a program. Used in this sense, an item's definition is machine and program oriented rather than operationally oriented. Item definitions shall include:

Item tag.

Purpose of the item (a brief statement).

Table in which it is found.

Table entry type in which it is found.

Position in entry (word number and bit positions).

Item use; e.g., table control item, entry structure key item, string control item, data item.

Item type; e.g., symbolic character, integer, fraction, mixed number (fixed or floating point) string, bead, status.

Item coding, depending upon the item type, for example:

Symbolic - character code used.

Integer - binary or binary coded decimal.

Fraction - scaling factor.

Mixed number, fixed point - point position.

Status - the maximum number of conditions, form of status values (symbolic or numeric binary), a list of all acceptable status values or conditions.

Accessibility factor - coded to indicate machine instruction modifiers that can expedite fetching and storing of the item; e.g., FW (full word), LHW or RHW (left- or right-hand word), B (byte size), M (mask necessary), etc.

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3.5 Arrays. Arrays are useful for expressing groups or ranges of variables, each of which is related to two or more distinct elements, such as a temperature-humidity matrix. The definition of an array shall include:

The array tag or identification code.

A brief statement of its purpose or function.

The number of elements (or "dimensions" of the array).

The name and meaning of each dimension.

The number of cells in each dimension.

A definition of each item in the array (see item definition, paragraph 3.4).

3.6 Records and Entries. In some business systems the basic unit of the data file is a record or an entry. These data units shall be as thoroughly defined as tables (see Paragraphs 3.3 and 3.4). In addition to the file structure presented in the language of the compiler being used, the following information shall be given:

Full name and purpose of the record or entry.

An explanation of each item in the data unit.

Maximum size of data unit.

Graphic representation of the unit as it is contained in the file, and examples of the output obtained from the file with significant output editing features, if applicable.

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4. DATA BASE STORAGE

This section shall contain all of the internal and peripheral storage assignments for all of the programs and data of a system. In addition, it will contain information relevant to certain constraints and conditions under which the programs must operate. Such constraints, based upon a design for the most efficient utilization of the system's storage media, can apply to both autonomously operated systems and systems that function within the environment of larger, machine operating systems.

4.1 Core Map for the System. This paragraph shall include both listings and graphic representations showing the utilization of internal storage. It shall include, as applicable, the following information.

Hardware protected program areas.

Hardware protected data areas.

Areas set aside for the residence of permanent programs and data (program "overlay" areas and data "scratch" or working areas).

This paragraph shall also contain a brief statement of the system design considerations that resulted in the system's core utilization scheme.

4.2 Program Storage - Core. This paragraph shall list the assigned core storage addresses for all system programs.

4.2.1 Permanent Core Assignments. This paragraph shall include all programs permanently assigned to core storage.

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4.2.2 Temporary Core Assignments. This paragraph shall include all programs with temporary core assignments, along with significant conditions or criteria pertinent to the program's utilization of an overlay area (for example, timing conditions or item settings used by an Executive to operate this program).

4.3 Data Storage - Core. This paragraph lists the assigned core storage areas for all of the system's data units used by the programs (tables or records, I/O buffer areas, etc.). It shall list, separately, all data permanently assigned to core, and all data occupying core on a temporary basis. In addition, there shall be a key or indicator with each data unit linking it to its peripheral storage location.

4.4 Peripheral Storage. This paragraph shall list, by device and sequential storage area, all peripheral storage assignments for both programs and data. The storage listing for each device shall explicitly state all addresses, areas, blocks, etc. covering the following:

- Permanent program and data storage assignments.
- Temporary program and data storage assignments.
- Areas reserved for special purposes such as testing, experimental, or emergency use.
- Scratch or working areas.
- Unused areas.
- Logical "slot" or "cell" arrangements.

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5. DATA/PROGRAM RELATIONSHIPS

Since most program systems contain large amounts of data that are used by more than one program, this section of the Data Base Specification shall be arranged by data tag, and every program using that data shall be indicated. The particular use that the program makes of that data (corresponding to a., b., and c. below) shall also be indicated.

A program "uses" data when it:

- a. Stores or deposits information into an item.
- b. Reads, fetches, or examines the contents of an item.
- c. Both stores and reads the contents of an item.

For systems in which data is not formally structured into tables, this section shall list all item-level tags and the programs using the item. Where tables are used as data units, the listing shall be by table tag. The inclusion of larger data and program entities in this section (e.g., data files and program tasks) shall be optional.

6. RELATIONSHIP OF OPERATIONAL SYSTEM DATA TO THE INTERNAL DATA BASE

This section shall cross-reference the nomenclature of system data used for operational purposes with the data nomenclature used for programming purposes. When feasible, the cross-reference shall be in the form of a thesaurus containing:

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Part 1. Inputs

The following shall be provided for each piece of input information:

Name.

Operational significance (stated briefly)

Primary origin (optional).

Input vehicle (e.g., message label, control card name, switch setting, etc.)

A list of all data base items dependent upon that input information for their contents.

Part 2. Outputs

The following shall be provided for each piece of output information:

Name.

Operational significance.

Ultimate destination (optional).

Output vehicle.

A list of all data base items from which the information is derived.

Part 3. System Constants

The following shall be provided for each constant:

Name.

Operational significance.

Corresponding data base item.

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Part 4. Control Parameters

The following shall be provided for each parametric item:

Operational name.

Reason for its use as a parameter.

(e.g., "Defines local topography at each radar site")

A list of data base items dependent upon this parametric information.

Note: The control parameters included here are influential in controlling the total system operation. They are not normally input during the system's operations. Examples are:

Equipment configuration descriptors, especially in a multi-site system.

Mode of operation directives.

Time synchronization items.

It is recognized that many normal system input items are also parameters, but they will be included in Part 1 above.

If the volume of data in a given system is so great that a complete thesaurus is not feasible as part of the data base specification, then a substitute data cross-reference plan must be specified. Some possible alternatives are given below:

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Publication of a separate data thesaurus which will be referenced in this section of the Data Base Specification.

A cross index of message/display labels or titles and table tags, with detailed references to the documents describing the messages/displays in detail.

Categorization of specific operational functions, listing under each function: inputs, outputs, and tables used, with references to appropriate separate documents.

None of the above alternatives are as thorough as a thesaurus, but for very large systems they may be adequate and in terms of time, effort, and cost, they may outweigh the advantages of a thesaurus.

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APPENDIX

SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The Appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in the Appendix, these are to be completely defined in the body of the specification. The Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs. The individual items will be in accordance with the usage in the higher order documentation.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Staff Manuals by a computer system developer when required as a part of a NAVCOSACT project.

1.2 Scope of Specification

1.2.1 General. Each Staff Manual shall include the information starting with Section 1 GENERAL DESCRIPTION below in the order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable to every system for which a Staff Manual is written and portions not pertinent to a particular system may be designated not applicable by the Project Leader. At the discretion of the Project Leader, this document may be combined with the Operations Manual and the Program Maintenance Manual into a single volume, three part document retaining the same numbering system and presenting the same information as stated for each individual document. Part 1 will be the Staff Manual, Part 2 will be the Operations Manual and Part 3 will be the Program Maintenance Manual. This single volume will be called the Project Manual.

1.2.2 Reader Orientation. The Staff Manual presents general and applied information on a specific computer system. It is directed toward an organization's general management and staff personnel and the management and staff of the affected operating divisions and functional areas. The Staff Manual meets the requirement of those who need or desire an overall

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appreciation of the system but have no need for detailed technical information concerning system implementation or operation. The descriptive material shall serve to orient the reader and inform him of the system functions and capabilities with respect to the ADP facility and the affected general operational organizations or command. This information shall also tell the reader how to use the system when required.

2. CONTENT OF THE STAFF MANUAL

The content of the Staff Manual shall be in accordance with the format on the following pages through Appendix B.

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1. GENERAL DESCRIPTION

1.1 Purpose of the Staff Manual. Paragraph 1.1 shall describe the purpose of the Staff Manual. The description will be in accordance with the following NAVCOSACT objective for preparation of a Staff Manual:

Provide the Staff (non-ADP) personnel of the user with the information necessary to effectively use the system.

1.2 System Application. The application of the system and its uses supporting functional activities of the command organization and/or in supporting program operations in the ADP facility shall be generally stated and explained. The description shall include:

- a. Application purpose, reason or rationale.
- b. Capabilities and operating improvements provided by the system.
- c. Additional features, characteristics, and advantages considered appropriate in furnishing a clear and complete description of the system application and the benefits derived from it.
- d. Functions performed by the system under the application such as pre-processing or post-processing data input to or output from a primary processor; maintenance of data files; translation of source language programs; control sequencing of operating program runs.

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1.3 System Operation. This paragraph will show the relationships between the ADP functions for either functional or support type systems and the several functional areas or activities of the organization that are sources of input to the system and/or are recipients of output from it. An information flow diagram of the type illustrated in NAVCOSSACT STD 50-15 Program System Chart Types shall be used. A brief narrative description accompanying the information flow diagram should tell the reader only the who, what, where and why concerning inputs and outputs associated with the system information flow chart.

1.4 System Configuration. A brief narrative description of the system's equipment shall be given for the clarification of the reader. This may include the type of computer and the array of peripheral equipment.

1.5 Performance. This paragraph shall inform the reader of the overall performance of the system or how well it meets the organization's information requirements or supports associated activities. Performance measures and data of interest would be represented by the following examples:

- a. Error Rate - also describe program system capabilities in detecting various legal and logical errors and the means provided for error correction.
- b. Response Time - also include qualifications where necessary that affect response time in processing operational reports, listing a tape, compiling an object program, etc. Factors such as type and volume of input and equipment configuration are examples of items that may influence running time.

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- c. Accuracy - when numerical outputs are produced state accuracy in terms understood by reader, e.g., accuracy to 3 decimal places vs accuracy to 6 binary bits.
- d. Input - Types, volumes, rate of inputs accepted by the program system.
- e. Output - Types, volumes, rate of output that the system can produce.
- f. Limitations - For example, max. size per unit of input; format constraints; restrictions on what data files may be queried and by what location; language constraints as a function of compiler design.
- g. Flexibility - note provisions allowing extension of the application of the system.
- h. Reliability - note system provisions that support alternate processing or a switch-over capability, as examples.

1.6 System Organization. The objectives here shall be to provide the reader with a general understanding of the system's organization. A hierarchical or "tree" type of presentation shall be given that shows as appropriate the logical parts of the system such as subsystems and programs with a brief description of each telling the reader its role in the operation of the system.

1.7 Data Base. The data files that are referenced and/or supported or kept current by the system shall be described. These files shall be identified in operational or functional terms rather than by program

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designations for the benefit of the general reader. The brief description should include the type of data in the file and the usage made of it.

1.8 General Description of Inputs, Processing, Outputs. This paragraph shall present a general narrative description of the inputs, the flow of data through the processing cycle, and the resultant outputs. Representative items for consideration are the following:

- a. Purpose of input - explain why the input is made to the program system and note conditions or events requiring its submission.
- b. Content of input - describe what the input contains in the way of operational, control, or reference data for the system.
- c. Associated Inputs - reference inputs required by the system with this input.
- d. Origin of inputs - identify the source or preparer of the input.
- e. Data Files - identify in general or functional terms the files associated with the input.
- f. Other - additional remarks supporting a complete tabulation of general information on inputs to the system.
- g. Processing, - relate input to output with a general description of the flow of data through the processing cycle.
- h. Output - list outputs produced by the system as a consequence of the input.
- i. Purpose of output - explain the reason for the output and note conditions or events that require its generation by the system.
- j. Content of output - describe in general terms the information provided by the output.

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- k. Associated Outputs - reference other system outputs that complement the information in this output.
- l. Distribution outputs - note the recipients in the ADP or other functional areas of the organization who receive this output.
- m. Other - additional items that contribute to a complete tabulation of general information on the system outputs.

2. TECHNICAL OPERATIONS

Section 2 of the Staff Manual shall provide the reader with all the details necessary to prepare inputs to the system. The scope, quality, and logical arrangement of the information shall enable the staff and operational personnel to prepare inputs required by their operations correctly and expeditiously. In addition, this section will explain in detail the characteristics and meaning of the information the system produces as outputs.

2.1 Input Requirements. The requirements to be observed in preparing entries to the system shall be delineated here for each class of input.

Typical considerations are the following:

- a. Cause of input - what operational conditions require submission of the input (e.g., catastrophe; normal status report; need to translate input data or a source program; desire to query a data file).
- b. Time of input - when must the input be received by program system (e.g., periodically; randomly as a function of an operational situation).

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- c. Origin of input - identify activity or location authorized to generate the entry.
- d. Forms of input - identify format or layout sheet of card required to compose the input. Also, note the need of a job submission or request for ADP services form, which represents a formal interface between Staff and ADP Control personnel. The provisions in the form for entering items such as processing required, disposition and retention of data are to be described.
- e. Medium of input - note the medium on which the input is entered into the processor (e.g., punched card; mag or paper tape; keyboard).
- f. Associated Inputs - reference related inputs (explained also in this Section 2) that are required to be entered at time of this input.
- g. Other - note applicable information such as non-machine recipients of the entry; priority and security handling; variations on the basic entry format using code or key indicators; limitations on what files may be interrogated by a query type of input.

2.2 Composition Rules. This paragraph shall provide a description of the language and the grammatical rules and conventions that must be observed in order to write entries that can be "read" by the program system. The rules of syntax, usage of punctuation, and the allowed vocabulary will be explained. Items for consideration may include the following:

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a. Input Length - e.g., 100 characters max.

b. Line Length - e.g., 30 characters max.

c. Format - e.g., all entry items left - justified.

d. Labeling - i.e., usage of tags or identifiers to denote major data sets to the system.

e. Sequencing - i.e., the order and placement of items in the input.

f. Punctuation - i.e., spacing and use of symbols (virgule; asterisk; character combinations; etc.) to denote start and end of input, of lines, of data groups, etc.

g. Combination - i.e., rules forbidding the use of particular character or parameter sets in an input to system.

2.3 Vocabulary. This paragraph shall explain the appended listing of legal character combinations or codes that are used to identify or compose input items such as mission or operation; data file or a call-up parameter; inventory item; statements or operations.

2.4 Input Formats. The layout form(s) used in the initial preparation of system inputs shall be illustrated and the information which may be entered on the various sections and lines explained. The explanation of each entry provision shall be keyed to the sample form illustrated.

2.5 Sample Inputs. Each class or type of entry acceptable by the system shall be illustrated. An introduction will be given as to the circumstances or reasons for the generation of the input or in other words what the sample represents. Then, a complete explanation shall follow on the

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significance of the entries in the sample input. Typical items to be explained can include:

- a. Control or Header - containing entries that denote input class or type; date/time; origin; instruction code to system; etc.
- b. Text - containing single entries and group/sub-group items representing data for operational files; request parameters for an information retrieval program; etc.
- c. Tail or Trailer - containing end of input and additional control data.
- d. Omissions - indicate those items or groups that may be omitted at the option of the composer or because of particular circumstances concerning the input.
- e. Repeats - indicate those items or groups that may be repeated up to a specified maximum number of entries, if required by the composer.

2.6 Output Requirements. The requirements relevant to each class of output shall be described. Representative items that may be included are:

- a. Purpose - concerning the reason(s) why the output is generated such as a consequence of an input or the existence of an "exception" situation.
- b. Time - indicate if the output is randomly or periodically produced.
- c. Modes - concerning modifications or variations of information provided by the basic output type.

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- d. Medium - concerning physical form of output such as printout, tape, screen, cards, cathode-ray tube (CRT).
- e. Location - concerning where the output is required to appear such as in the ADP area or remotely at a functional area (e.g., Materiel Control).
- f. Other - note additional requirements for this output such as priority and security handling; associated outputs that complement the information in this output.

2.7 Output Formats. The layout(s) in which the system output(s) is presented shall be explained in detail. Explanations shall be keyed to particular parts of the format(s) illustrated. Appropriate items in an output format that may be considered include the following:

- a. Header - title, identification, time, number of output parts and similar basic control data that may be contained in an output's header or control segment.
- b. Body - note the information that may appear in the body or text of the output format. Describe the significance of fixed data in the body such as columnar headings in tabular display types of output. Also note the existence of sub-sets or sections in the output format (e.g., PART A, PART B). In Card/Tape output describe the position or column locations allocated to specific output information.
- c. Tail - note provisions for control or reference information that may be appended to the body of information presented.

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Additional characteristics concerning the make-up of outputs may include items such as suppression of leading zeros for numerical information and a maximum number of characters per item, thereby requiring the use of abbreviated entries in the output.

2.8 Sample Outputs. Illustrations of the type of output obtainable from the system shall be given for each different class of output. The function or purpose of the sample or dummy output shall be explained. A detailed description will then follow for the items shown in the sample. The following points will be included in the description:

- a. Definition - the meaning and use of each information variable for the reader or user.
- b. Source - item extracted from a specific input; from a data base file; calculated by system; etc.
- c. Characteristics - concerning item's omissibility under certain conditions of the output generation; range of values; unit of measure.

2.9 Utilization of Outputs. Primarily for the outputs from functional systems an explanation shall be given of the application of the output in the operational area or activity which receives it. A summary report of POL stocks, for example, would be received by a materiel control activity. Depending on the information in the report, action might be required to initiate the purchase or transfer of materiel to a particular location.

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BIBLIOGRAPHY

The bibliography will provide a list of direct and indirect references which are worthy of note by the readers. Each entry will contain Title, Date, Document Number and Classification, Author, and Publisher if applicable. The title of books, papers, reports, and pamphlets, will be underscored; the titles of articles within a publication will be placed in quotation marks. The entries will be arranged alphabetically by author.

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APPENDIX A

SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The Appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in this Appendix; these are to be completely defined in the body of the document or separate appendices. This Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs.

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APPENDIX B

GLOSSARY OF ITEM CODES

This appendix will provide the following information:

- a. An alphabetical listing of item codes that can be entered into an input to the system or that can appear on an output from the system.
- b. An alphabetical listing of functional or generic categories, e. g., materiel control, weather, ship type. Each of these basic categories will contain an alphabetical listing of associated data items and their code representation.

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3. DOCUMENT REVIEW

3.1 Preliminary Review. The preliminary draft of the proposed Staff Manual shall be given a preliminary review to determine that the material contained therein is sufficiently complete to warrant the preparation of a final copy. Acceptance or approval of a preliminary draft in the course of preparation of the proposed Staff Manual shall in no case be construed as a guarantee of acceptance of the final copy. The preliminary review shall include, but not necessarily be limited to, a review of the following features:

- a. Application of reference documents
- b. Format and arrangements
- c. Style and phrasing
- d. Suitability of headings
- e. Length of paragraphs
- f. Physical lengths of the document
- g. Correctness of cross references
- h. Numbering
- i. Use of abbreviations and symbols
- j. Grammar
- k. Punctuation
- l. Technical accuracy and clarity
- m. Technical completeness
- n. Absence of contractual information

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<p>3.2 Final Review. The final copy of the proposed Staff Manual shall be given a final review to determine that the requirements of this specification have been satisfied. Final review will include, but not necessarily be limited to, a review of the features listed under preliminary review and the following:</p> <ul style="list-style-type: none">a. Quality of duplomatb. Quality of typingc. Reproducibility <p>4. PROCUREMENT DATA</p> <p>4.1 Ordering Instructions. Procurement documents concerning Staff Manuals should specify the following:</p> <ul style="list-style-type: none">a. Title, number, and date of the Staff Manualb. Applicable requirements for packing, packaging and shipment			

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This specification provides guidance for the preparation of an Operations Manual by a computer system developer when required as part of a NAVCOSSACT project.

1.2 Scope of Specification.

1.2.1 General. Each Operations Manual shall include the information starting with Section 1. GENERAL DESCRIPTION below in the order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable to every system for which an Operations Manual is written. Portions not pertinent to a particular system may be designated as not applicable by the Project Leader. At the discretion of the Project Leader, this document may be combined with the Staff Manual and the Program Maintenance Manual into a single volume, three part document retaining the same numbering system and presenting the same information as stated for each individual document. Part 1 will be the Staff Manual, Part 2 will be the Operations Manual and Part 3 will be the Program Maintenance Manual. This single volume will be called the Project Manual.

1.2.2 Reader Orientation. The Operations Manual prepared in accordance with the requirements of this specification shall contain precise and detailed information on the control requirements and operating procedures necessary to successfully initiate, run, and terminate the operations of the subject system. It is directed toward Management, Supervisory, and

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Operator personnel who are responsible for the efficient performance of their organization's ADP facility. These readers are primarily interested in detailed information on the system's external characteristics and operating procedures. In general the manual shall be written in a step-by-step fashion as opposed to an expository style in order to clarify and emphasize the procedures associated with the system. The Operations Manual shall be completely self-contained. Supporting illustrations shall be concerned with the flow of input data and output information but shall not present breakdowns or delineations of the system's internal logic and flows such as are depicted in program flow charts.

2. CONTENT OF OPERATIONS MANUAL

The content of the Operations Manual shall be accordance with the format on the following pages through the Appendix.

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1. GENERAL DESCRIPTION

1.1 Purpose of Operations Manual. Paragraph 1.1 shall describe the purpose of the Operations Manual. The description will be in accordance with the following NAVCROSSACT objective for preparation of an Operations Manual:

Provide control and operator personnel with a general description of the system and its associated environment with which they will be concerned during the performance of their duties.

1.2 System Application. A brief description of the system shall be given which tells the reader the title, project number and use(s) of the system.

1.3 System Operation. This paragraph shall describe the operation of the system by use of an Integrated ADP Flow Chart (NAVCROSSACT STD 50-15 Figure 5) which will show how the several runs, tasks, and jobs are interrelated in regard to input data and output information. If sets of runs are grouped by periods of time cycles then each set of integrated operations required on a daily, weekly, etc. basis will be presented. The inter-relationships among the system tasks in respect to timing and input/output data are of primary importance to control personnel. The diagram blocks shall be labeled to indicate appropriate name or number and purpose. The input and output symbols denoting cards, tapes, etc., that are shown associated with their particular run or operation and are associated with other runs or operations as inputs or outputs shall also be identified as to name and type of their data content.

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1.4 Program Inventory. This paragraph shall provide an inventory in tabular form of the programs, tasks, and runs in the system. Each component of the system shall be identified by title, number, and mnemonic reference as applicable. The use(s) of each component and the approximate timing requirements of each component will also be given.

2. SYSTEM CONTROL

Section 2 of the Operations Manual shall present information on how the operations and environment associated with the system are controlled so that scheduling of operations, assignment of equipments, and the management of input data and output information proceed in an orderly and productive manner. This type of information is of practical use to ADP management and control personnel, since it is reflected in their standard practices and regulations governing the operation of their ADP facility. In on-line systems, some of the description on system operational control will be related to the capability of the supervisory type of program which functions as a real-time controller of the operations and environment of a system.

2.1 Control Requirements. This paragraph shall present clear and concise instructions for control personnel, who are responsible for administration and control of a computer application from receipt of input to delivery of output. Items to be represented should include processing cycles (daily, weekly, etc.), coordination and control of input, library and output material, and the composition of instruction forms. The following items are representative of control considerations which may be applicable:

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- a. Receipt and identity of input data.
- b. Data preparation instructions.
- c. Control card preparation.
- d. Preliminary EAM processing instructions (major EAM operations are to be presented in detail in Section 3).
- e. Sequence of input.
- f. Quality control technique.
- g. Disposition of output.
- h. Disposition of source media (cards, transcripts, etc.)
- i. Control forms (see paragraph 2. 2).
- j. Deck Sequence (see paragraph 2. 4).
- k. Phasing (see paragraph 2. 3).
- l. Graphic Processing Chart (see paragraph 2. 5).
- m. Tape Retention Schedules (see paragraph 2. 6).
- n. Queries (see paragraph 2. 7).

2.2 Control Forms. This paragraph shall present illustrations of the applicable forms that support the various system control requirements. Each form shall be identified by name/title, form number, and functional use in the scheme of control. The significance of each entry provision in the form shall be explained for the reader. The following are the minimum control forms needed:

- a. **User Request** - This form should be designed to facilitate rapid recognition of users' requirements and designed to interface with control instructions. Contingent upon the project design, the form should include the following information:

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Date.
 Originator.
 Processing cycle/or option required.
 Date required.
 File "as of date."
 Check off of input supplied.
 Check off of output required.
 Security Classification Control Card data to be supplied
 by user.
 Copies required.
 Disposition of output.
 Special instructions.

b. Graphic Processing Chart (see section 2.5).

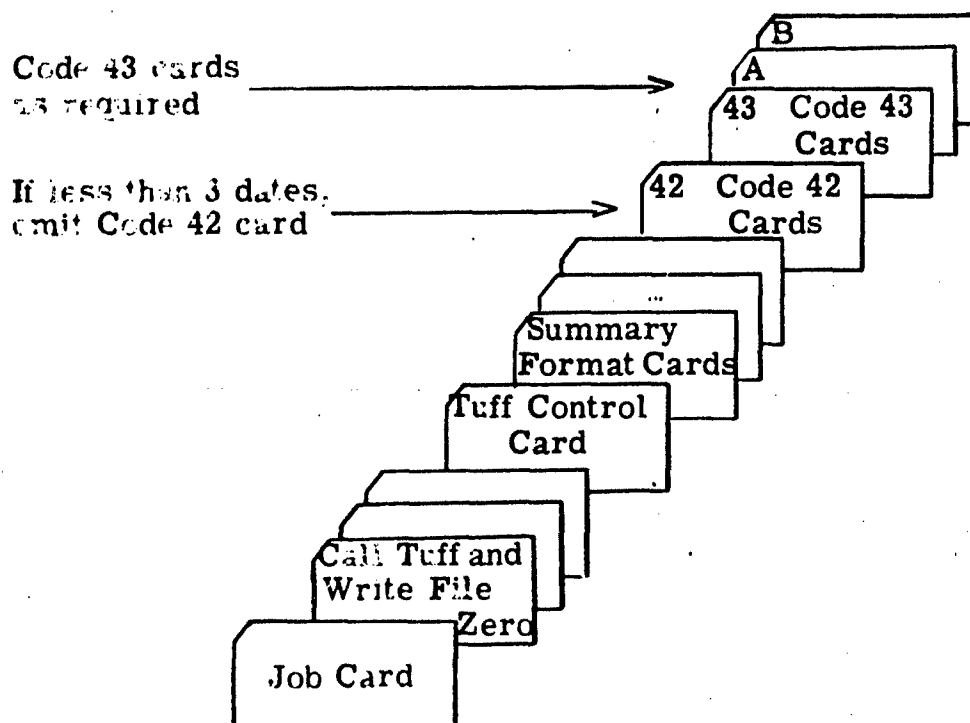
2.3 Phasing (ADP). This paragraph shall provide a schedule of acceptable phasing for each system run. Each ADP application is subject to being segmented into logical phases of operation. A system run may be phased to permit manual or semi-automatic checking of intermediate results, to provide the user with intermediate results for other purposes, or to permit a logical break if higher priority jobs are submitted to the ADP Center. The minimum division for most applications would be edit; file update; and report preparation. Job divisions, however, would be restricted to specific applications and should include considerations of the time lapse required for a processing cycle.

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2.4 Card Deck Sequence This paragraph shall present an illustration of the card deck sequence. Narrative material shall be included as necessary to explain details, constraints, exceptions, etc. concerning the assembly and use of the card deck. An example follows:

INPUT DECK ASSEMBLY (EXAMPLE)

Following is a schematic illustration of the order of assembly of an input deck at run time:



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2.5 Graphic Processing Chart (ADP). This technique has been developed as a method of requesting and controlling production processing operations. The Graphic Processing Chart is essentially a macro flow chart that has been modified to serve as a request document for computer operations. An example is shown on the following page. With the concurrence of the data administrator (user), Graphic Processing Charts are to be prepared for each phase of the system as described in control requirements (section 2.1). Applications with flexibility of run sequence to produce varied output should be established as options, with accompanying graphics depicting sequence of runs required.

2.6 Tape Retention Schedules (ADP). Tape Retention Schedules are to be developed in accordance with the requirements for data retention of the data administrator. It is expected that due consideration will be given to this matter so that the resulting schedule will reflect only those tapes (and with realistic retention periods) for which a bona fide requirement exists. Tape storage facilities are limited and a dynamic system of tape replacement and release is necessary.

Consideration should also be given for temporary retention during processing cycles to provide for verification of output prior to release of tapes, backup, and requirements for alternate site storage, etc. Basic information required is as follows:

- a. Project Number.
- b. ~~Subsystem~~ Number (if applicable).
- c. Tape Name.

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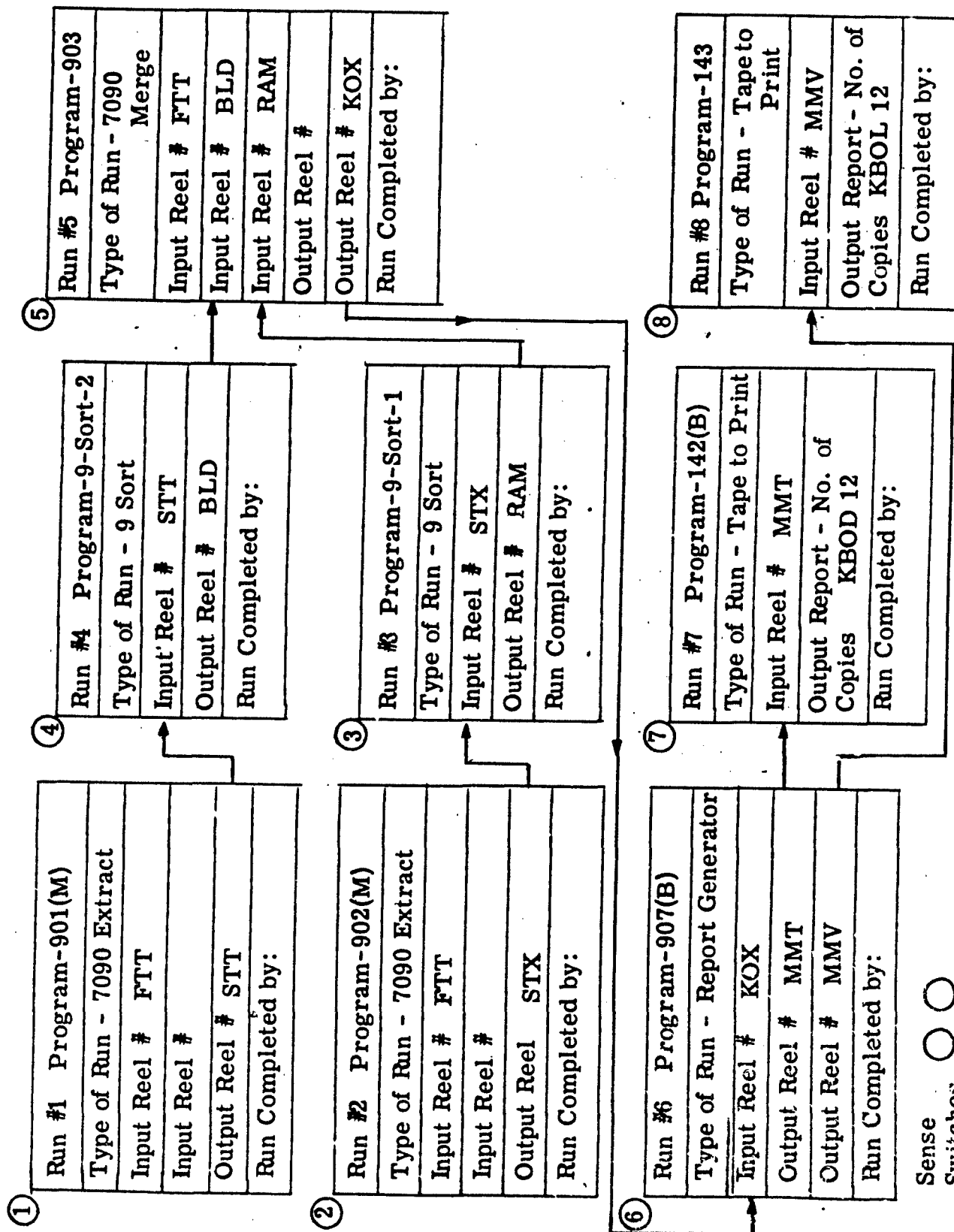
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GRAPHIC PROCESSING CHART (EXAMPLE)

Sense
Switches 1 2

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- d. Run number generated.
- e. Retention Schedule (Classifications) to include:
 - Release data (if applicable).
 - Replacement instructions.
 - Hierarchy instructions.
 - Retention duration.

2.7 File Query Procedures. This paragraph is to be prepared for computer projects with a functional query retrieval capability. The instructions necessary for recognition, preparation, and processing of a query request as applicable to subject data base are to be cited in detail. The descriptive techniques illustrated in Sections 2.7.1, 2.7.2 and 2.7.3 are to be utilized as applicable.

2.7.1 System Query Capabilities. This paragraph shall illustrate in tabular form the preprogrammed query capabilities provided by the system with a cross-reference to a format table code or identity (see example below). An illustration should be given to show the relation of a query request to a specific query format.

PREPROGRAMMED QUERY CAPABILITIES (EXAMPLE)

Query

Format Table

All ships in particular Fleet

A

Specific ships in particular Fleet

B

Units assigned to specific Task Force

C

A/C Aboard specific ship

D

Ships with A/C aboard

E

Ships within a radius location, etc.

F

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2.7.2 Data Base Format. This paragraph shall illustrate the data base format and content (see example below). Indicate, if applicable, data base items which are not subject to query extraction and/or those data base items which should be extracted for all queries whether or not specifically requested.

DATA RECORD FORMAT (EXAMPLE)

<u>Item No.</u>	<u>Item Name</u>	<u>WKM</u>
1	Ship/Unit Name	Ø 1 2 4 Ø
		1
		2
		3
2	Message DTG	4 2 8 4
3	Fleet/Ocean	5 6 1 5
4	ETA	6 1 5 6

2.7.3 Query Preparation. Instructions are to be provided for the preparation of query title, request, and output cards. The details of query card preparation in the context of this specific data base and system retrieval capabilities are to be repeated as necessary in the form of positive instructions. The examples on the following page present a recommended format to be prepared for each query capability provided. This format will be utilized by control personnel to transcribe planned queries into the technical phrasing of the retrieval system and provide copy suitable for conversion into punched cards and/or punched paper tape.

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25**FORMAT TABLE A (EXAMPLE)****Query Item Title****Begin Card Cols.****Query Designator****1-Q****File Number****2-01****Permanent Coding app-****Query Number****4-01****licable to Format Table A****Security Classification****10-SE****Format Table Code****12-A****Sequence Number****13-A****Fleet****14****Insert Fleet code as re-
quested by query-refer to
data format for applicable
code.****FORMAT TABLE B (EXAMPLE)****Query Item Title****Begin Card Cols.****Query Designator****I-Q****File Number****2-01****Query Number****4****As applicable****Security Classification****10-SE****Provide preprinted form as illustrated above for each query possibility
programmed.**

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2.7.4 Control Instructions. Instructions are to be provided for Control personnel on the sequencing of runs and the program necessary to extract the response to the query request from the data base. These instructions shall include the requirements for and the preparation of control cards as may be required by the system or functional programs.

3. OPERATING PROCEDURES

Section 3 of the Operations Manual shall present the procedures and materials required to perform each of the individual runs, operations, tasks, etc. that comprise the system. The presentation of procedural actions and responses required of the operator in regard to inputs required, machine indications, and outputs expected shall be made in a logical manner and shall follow the sequence normally required in performing the run. In addition, procedures shall be provided that cover the occurrence of abnormal or unexpected operations.

3.1 EAM Tasks. EAM tasks unique to a particular system will be presented. EAM tasks which are routine with most systems will not be included. The basic sequence of setup-operate-terminate shall be followed in presenting the EAM run procedures. Representative of the items for which detailed information is required for each EAM run are the following:

a. Input Materials

Input data forms or decks (e.g., content, code, structuring).
Output data forms or cards (blanks for card punch or printer).
Program or format cards or tapes.

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Control/Admin forms authorizing the run.

Instruction or layout sheets specifying what is to be done to input data (keypunching of characters into specified columns or fields; sorting by a particular item of card data).

Sources of input materials (control supervisor; operator of a prior run).

Disposition of input materials (return to control supervisor; excess forms to stockroom; pass to operator of a succeeding run).

b. Output Expected

Specify the output(s) expected from the run.

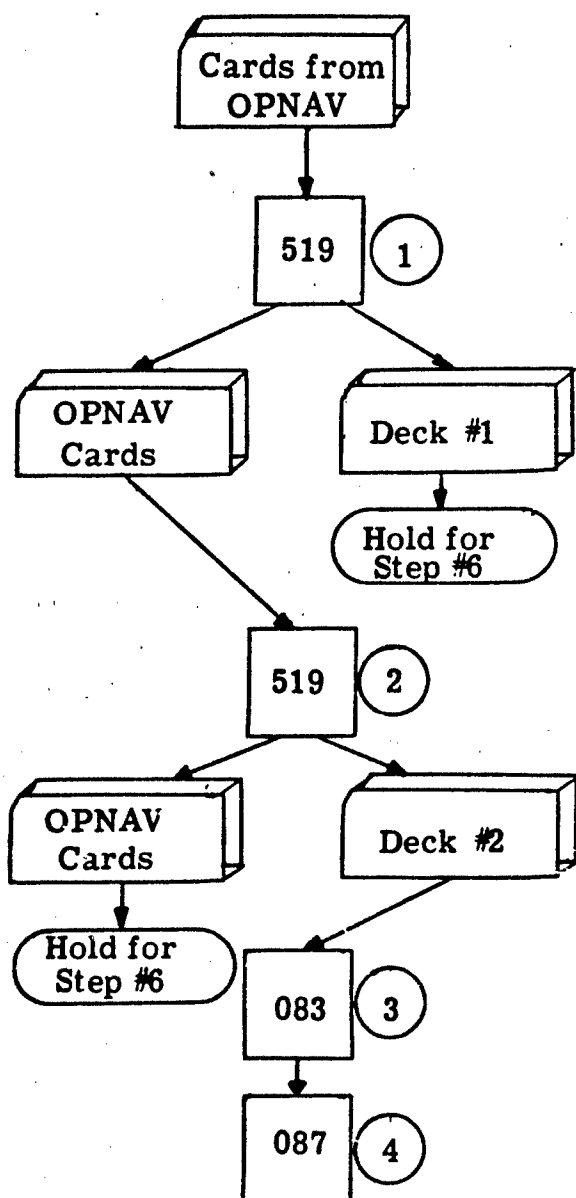
Note any checks or verifications that may be required.

Specify the disposition of the output (forward to control; to operator of a succeeding run). Note also any requirements for binding, deleafing, packaging, labeling, and the like.

- c. Procedures** - Itemize the step-by-step requirements of actions, indications, and responses for the operator in setting up, operating, and terminating the run (setting of switches, insertion of program boards, etc.). Include, where appropriate, operator actions in response to an aborted run or an unsuccessful run (output not as specified) such as restart, notify supervisor or EAM maintenance. At the discretion of the Project Leader, a flow diagram of EAM tasks may be included. An example is on the following page.

OFFICER PROMOTION LIST

Pre-punched cards are received from OPNAV Communications for tapes to be cut for ALNAV Messages. THE SEQUENCE OF THE CARDS FROM OPNAV SHOULD NOT BE CHANGED, BECAUSE OF PRECEDENCE.



1. With control panel wired as in encl. #1 reproduce the cards from OPNAV, omitting a Ø and 1 in cc. 1 of alternate cards. Reproduce only name cc. 1-2Ø into cc. 8-27. Be sure to precede cards to be reproduced with a blank card. Be sure first card has "Ø" in cc. 1 and second has "1", third has "Ø", etc. Label this deck #1.

2. There is an alternative in step #2. The reproduced cards can be reproduced 80-80, dropping cc. 1 or reproduce with the control panel in step #1, using OPNAV cards. Omit wiring for cc. 1. Label this deck #2.

3. Take deck #2. Sort alpha cc. 8-27

4. Sequence check on the above field.

EAM TASKS FLOW DIAGRAM (EXAMPLE)

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3.2 Equipment Configuration. The EAM Units and the EDP Units required to implement this operation shall be listed and identified. As examples:

- a. EAM Sorting Run (input data on form sheets).
 - Key Punch - (identify).
 - Card Sorter - (identify).
- b. EDP Card-Tape Run (preprocessing of data).
 - 1401 Processor.
 - Card Reader - (identify).
 - Tape Adapter - (identify).
 - Tape Unit - (identify).

3.3 EDP Tasks. The EDP tasks that the system provides are performed on the ADP facility's data processor with the support of appropriate peripheral units which provide input, output, and auxiliary storage. All necessary procedures and input-output information shall be presented for each EDP run or operation of the subject system. The runs delineated for control and operator personnel may apply to an auxiliary data processor in the ADP facility or to a main or primary processor. The scope and content of the information presented will enable control personnel to specify in detail the materials and procedures required for the operator(s) to perform the EDP run or job. Representative of the information required for each EDP run would be the following:

- a. Input Materials - The checklist items listed under paragraph 3.1.a. are applicable to EDP runs. In general, the physical form will be punched cards, paper or magnetic tape, and keyboard messages. Functionally the inputs will represent a program to be loaded and/or input data (reference and/or current transactions).

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- b. **Outputs Expected** - The checklist of items under 3.1.b. are applicable to EDP runs. In general, the outputs can be produced as punched cards, paper or magnetic tape, hard copy printouts, or CRT and screen displays which contain the information desired from the program run.

c. **Procedures**

Setup - these procedures shall itemize the logical sequence of operator actions in selecting and initializing the specified peripherals and the central processor console so that the programs associated with the run may be loaded and readied for operation. On-line runs will have a control program assisting in setup procedures and communicating instructions to the operator via the control console. Samples of completed run sheets will be included. The development of individual run sheets will be coordinated with the user in order to insure compatibility with existing user requirements. An example of a run setup sheet is shown on the following page.

Operation - these procedures shall itemize the logical sequence of operator actions in loading the input data (dynamic and reference) for read-in to the processor and initiating the run at the console. Attention shall be given to noting the correct sequence or order of reading of data (e.g., control cards for date, job number, file ID, etc. followed by data sets and end-of-input cards). An illustration of card deck sequence will also be included here.

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1401 OPERATING INSTRUCTIONS								
Project Number			Program Name		Program Number		Run Number	
TAPE INPUT/OUTPUT								
Unit No.	Dens	Label	In-Put	Out-Put	Class	Source/Disposition		
READER INPUT								
Order of Input		Sequence Cols. (Data)		NR Disposition		4 Disposition		8/2 Disposition
PUNCH OUTPUT								
Card Type	NP Disposition	4 Disposition	8/2 Disposition	Carriage Tape Channel Line				
				1		Carr		
PRINTER INFORMATION				2		Tape		
Forms Type	Number of Copies	Disposition	Printer Alignment	3		Lgth		
			Vertical	4				
			Horizontal	5				
PAPER TAPE				6				
Control Panel No.		Source	Disposition	7				
				8				
				9				
Tape Punch Level			Disposition	10				
0	0	0		11				
5	7	8		12				
Sense Switches								
* = See Opr. Instr. X = Switch on Blank = Switch Off			O O O O O O O I/O A B C D E F G					
General Operating Instructions								
Printer Comments 1407								
Printer Comments 1403								
Halts								
I	A	B	Reason			Action to be Taken		
RUN SETUP SHEET (EXAMPLE)								

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Input keyboard messages in on-line operations will provide similar system direction by virtue of their header information. Included in this section on Operation shall be applicable information on data processor - operator communications that can occur during the run. Specifically, tabulations shall be presented on:

- a. Error Messages.
- b. Program Normal Halts.
- c. Program Abnormal Halts.

The tabulation shall identify the output; its cause; its medium (console typewriter, card punch, printer or console register display); the response or action required of the operator and any feedback or response from the processor as a result of the action. Examples will be given of the formats of these inputs and outputs.

Termination - These procedures shall inform the operator of the sequence of actions that must be followed in returning the peripherals and processor to their standby condition from which setup procedures for the next operation may proceed.

4. NON-ROUTINE OPERATIONS

The purpose of Section 4 of the Operations Manual shall be to provide, as applicable, control information and operator procedures to cover emergency or non-routine ADP operations. Representative of the situations that may be covered in the paragraphs of this section are the following:

- a. Recovery from a power-off or failure condition.
- b. Switchover to a redundant system or to a standby system.
- c. Turnover to maintenance for system testing or modification.
- d. Priority restart procedures.

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<p style="text-align: center;">BIBLIOGRAPHY</p> <p>The bibliography will provide a list of direct and indirect references which are worthy of note by the readers. Each entry will contain Title, Date, Document Number, Classification, Author, and Publisher, if applicable. The titles of books, papers, reports and pamphlets will be underscored; the titles of articles within a publication will be placed in quotation marks. The entries will be arranged alphabetically by author.</p>			

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APPENDIX

SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The Appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in this Appendix; these are to be completely defined in the body of the document or separate appendices. This Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs.

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3. DOCUMENT REVIEW

3.1 Preliminary Review. The preliminary draft of the proposed Operations Manual shall be given a preliminary review to determine that the material contained therein is sufficiently complete to warrant the preparation of a final copy. Acceptance or approval of a preliminary draft in the course of preparation of the proposed Operations Manual shall in no case be construed as a guarantee of acceptance of the final copy. The preliminary review will include, but not necessarily be limited to, a review of the following features:

- a. Application or reference documents.
- b. Format and arrangements.
- c. Style and phrasing.
- d. Suitability of headings.
- e. Length of paragraphs.
- f. Physical length of the document.
- g. Correctness of cross references.
- h. Numbering.
- i. Use of abbreviations and symbols.
- j. Grammar.
- k. Punctuation.
- l. Technical accuracy and clarity.
- m. Technical completeness.
- n. Absence of contractual information.

3.2 Final Review. The final copy of the proposed Operations Manual shall be given a final review to determine that the requirements of this specification have been satisfied. Final review will include, but not necessarily be limited to, a review of the features listed under paragraph 3.1 and the following:

- a. Quality of duplimat.
- b. Quality of typing.
- c. Reproducibility.

4. PROCUREMENT DATA

4.1 Ordering Instructions. Procurement documents concerning Operations Manuals should specify the following:

- a. Title, number and date of this Operations Manual.
- b. Applicable requirements for packing, packaging and shipment.

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Program Maintenance Manuals by a computer system developer when required as a part of a NAVCOSSACT project.

1.2 Scope of Specification

1.2.1 General. The Program Maintenance Manual shall include information starting with Section 1. GENERAL DESCRIPTION below in the order presented in this specification and under the paragraph titles specified. All paragraphs are not applicable to every system for which a Program Maintenance Manual is written and portions not pertinent to a particular system may be designated not applicable by the Project Leader. At the discretion of the Project Leader, this document may be combined with the Operations Manual and the Staff Manual into a single volume, three part document retaining the same numbering system and presenting the same information as stated for each individual document. Part 1 will be the Staff Manual, Part 2 will be the Operations Manual and Part 3 will be the Program Maintenance Manual. This single volume will be called the Project Manual.

1.2.2 Reader Orientation. The Program Maintenance Manual presents general and applied information on a specific system. It is written for programmer personnel who are part of the user's organization and are

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<p>responsible for the maintenance of the system operated in the user's ADP facility. It will be a detailed technical presentation.</p> <p>2. CONTENT OF PROGRAM MAINTENANCE MANUAL</p> <p>The content of the Program Maintenance Manual shall be in accordance with the format on the following pages through Appendix D.</p>			

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1. GENERAL DESCRIPTION

1.1 Purpose of the Program Maintenance Manual. Paragraph 1.1 shall describe the purpose of the Program Maintenance Manual. The description will be in accordance with the following NAVCOSSACT objective for preparation of a Program Maintenance Manual:

Provide the maintenance programmer personnel with the information necessary to maintain the system effectively.

1.2 System Application. In general, non-ADP terms, the purpose of the system and the functions it performs shall be explained. A particular functional type of system, for example, might serve to control mission activities by accepting specific inputs (status reports, emergency conditions), extracting items of data, and deriving other items of data in order to produce information for a specific mission's file and for printout of summary reports. These shall be related to paragraphs 2.3.3 Specific Performance Requirements, and 2.3.4, System Functions, of the Preliminary Functional Description (PFD).

1.3 Equipment Environment. The material in this paragraph shall discuss the equipment configuration and its general characteristics as they apply to the system.

1.4 Program Environment. This paragraph will present the interactions with support systems, within the programs themselves, and with any controlling system.

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1.5 Conventions. This paragraph will explain all rules, schemes, and conventions that have been adopted for use in the system. Information of this nature would include the following items:

Design of mnemonic identifiers and their application to the tagging or labeling of programs, sub-routines, records, data fields, storage areas, etc.

Procedures and standards in regard to flow charts, listings, and abbreviations used in statements, remarks, and comments appearing in charts and listings.

2. SYSTEM DESCRIPTION

The purpose of Section 2 is to show the structure, operation, and composition of the system as a set of interrelated programs.

2.1 General Description. This paragraph will provide a comprehensive description of the system, subsystem, jobs, etc. in terms of their functions and contribution to the system application. This description will be accompanied by a System Logic Chart in Appendix B. (Ref NAVCOSSACT STD 50-15).

2.2 Detailed Description. The purpose of this paragraph is to supply details and characteristics of each program that would be of value to a maintainer in understanding the program and its relationship to other programs. Special maintenance programs related to the specific system being documented will be discussed under Section 4.4, Special Maintenance Programs. Paragraph 2.2 will initially contain a list of all programs to be discussed therein, followed by a narrative description of each program under separate paragraphs starting with 2.2.1 through 2.2.N. Information of this type is represented by the following items:

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<p>Description of program functions.</p> <p>Number of program instructions.</p> <p>Data file records used by the program during operation.</p> <p>Branching conditions provided in the program.</p> <p>Entry requirements concerning the initiation of the program.</p> <p>Input data type and location(s) used by the program when its operation begins.</p> <p>Exit requirements concerning termination of the program operation.</p> <p>Communication or linkage to a next logical program (operational; control).</p> <p>Output data type and location(s) produced by the program for use by the next processing segment of the system.</p> <p>Response to errors detected during the program's input-processing-output operations.</p> <p>Restrictions that have been designed into the system in respect to the operation of this program.</p>			

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Permanency - note if the program is a normal link in the cycle of programs to be run or will be used under certain circumstances.

Storage - Specify the amount of storage required to use the program and the broad parameters of the storage locations needed.

Associated Programs - Identify the programs which can access this program.

Restrictions - Explain any limitations on the use of this program.

Major Operations - The major operations of each program will also be described. The description shall be referenced to the System Logic Chart(s) in Appendix B for the program being discussed. This chart will show the logical flow of operations such as read an input, access a data record, major decision, and print an output which would be represented by segments or sub-programs within the program.

Minor Operations - The minor operations are the logical series of operations performed by the program in order to realize the major operations. A Program Logic Chart(s) will be provided in Appendix C for each of the program's major steps (Ref NAVCOSSACT STD 50-15). Each step will be broken down into its logical details. Program Logic Chart(s) will be referenced to the block or symbol it represents on the System Logic Chart.

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3. INPUT/OUTPUT DESCRIPTIONS

The purpose of Section 3 of the manual shall be to provide information on the structure and composition of the system inputs and outputs.

3.1 General Description. This paragraph shall provide a general presentation of the inputs and outputs in regard to scope and the variety of information available in support of the system and maintained by the system.

3.2 Characteristics. The following types of information shall be provided in this paragraph including all of the information on the nature and content of each of the Input/Output elements required by the maintainer.

Identification - Name and mnemonic reference of the component (e. g. , data base).

Function - Explain the use of the element in the system.

Content - Describe the kind of data it holds. This may be operational data (input data; output information; reference data) or internal data such as results of intermediate processing, or directory information (routing/linkage tables) that enables a program to locate other records or to communicate with other programs.

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Permanency - Note if the element contains parametric data that a program can reference but may not change or dynamic data which can be changed or updated during system operation. Indicate if the change is periodic or random as a function of input data.

Storage - Specify the location(s) in which the element is held (e.g., tape; drum; core) and the amount of storage required.

Associated Programs - Identify the programs which can access this element during their operation. Indicate if the program only reads data or may also write new data into the record. Explain also how the program locates the element (e.g., table look up; index register).

Restrictions - Explain any limitations on the use of this element by the programs in the system.

3.3 Organization and Detailed Description of Input/Outputs. The purpose of this paragraph shall be to define the internal structure of the input-outputs (an example of each input/output will be listed as will its associated components such as records and tables). The layouts of each Input/Output element (e.g., data base) will be described, accompanied by appropriate explanatory details. The following items indicate the type of information desired:

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Layout - show the structure of the subject record.

Sections - note if the physical record is a logical record or one of several that constitute the complete logical record. Identify the record parts such as header or control segments and the body of the record.

Fields - Identify each field of data provided in the record structure and explain its purpose.

Tags/Labels - Indicate the tag or label assigned to reference each field of data.

Size - Indicate the length and number of bits/characters comprising each data field.

Range - Indicate the range of acceptable values for the field entry, if a numeric.

Expansion - Note provisions, if any, for adding additional data fields to the record.

3.4 Examples of Inputs/Outputs. This paragraph will give examples of (all) input/output elements associated with the system.

4. PROGRAM MAINTENANCE PROCEDURES.

Section 4 of the manual shall provide all information necessary for the programmer to maintain the programs that comprise the system.

4.1 Input-Output Requirements. Include in this paragraph the requirements concerning the equipment and materials needed to support a maintenance task. Materials may, for example, include card decks for loading a maintenance program and the inputs which represent the changes to be made.

4.2 Procedures. The procedures to be presented in a step-by-step manner shall show the maintainer the method of preparing the inputs such as the keypunching and structuring of an input and sequencing of inputs. Also, the operations or steps to be followed in setting-up, running and terminating the maintenance task on the machine shall be given.

4.3 Verification. This paragraph will include those requirements (e. g., test data) and procedures necessary to check out the performance of the program section following its modification.

4.4 Special Maintenance Programs. This paragraph shall contain an inventory and description of the uses of any special programs to maintain the system.

4.5 Other Special Maintenance Procedures. This paragraph shall contain any special procedures used by the maintainer which have not been delineated in Section 4, **PROGRAM MAINTENANCE PROCEDURES.**

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Specific information that may be appropriate for presentation would include:

Requirements, procedures and verification methods required to maintain the system input-output elements (data base).

Requirements, procedures and verification methods required to perform a Library Maintenance System run.

4.6 Listings. Under separate cover as Appendix D to this document will be a listing of coding statements written in symbolic programming language or a higher level language. Annotations shall be provided to introduce components of the system and clarifying remarks and comments appropriate to particular instructions shall be made.

BIBLIOGRAPHY

The bibliography will provide a list of direct and indirect references which are worthy of note by the readers. Each entry will contain Title, Date, Document Number and Classification, Author, and Publisher if applicable. The title of books, papers, reports, and pamphlets, will be underscored; the titles of articles within a publication will be placed in quotation marks. The entries will be arranged alphabetically by author.

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APPENDIX A
SYSTEM ABBREVIATIONS, MNEMONICS, AND TERMS

The Appendix will provide the definitions of terms or phrase definitions which carry connotations unique to this particular system or which are not sufficiently standard as to be adequately defined in standard dictionaries. Item names and location tags utilized by the various programs of the system will specifically not be included in this Appendix; these are to be completely defined in the body of the document or separate appendices. This Appendix is intended primarily to provide definitions of terms to be found in the documentation writing and not of terms unique to specific programs.

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<p style="text-align: center;">APPENDIX B SYSTEM LOGIC CHARTS</p> <p>Appendix B shall contain the ordered set of charts which show the major functions of the system. The charts shall support the narrative description of the system's major operation given in the Program Maintenance Manual under paragraph 2.2 Detailed Description. System Logic Charts will be prepared in accordance with Standard 50-15</p>			

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APPENDIX C PROGRAM LOGIC CHARTS

Appendix C shall contain the ordered sets of charts which show the logical series of detailed operations that are performed under each major function of the system. A set of charts shall be associated with each major operation of the system shown in Appendix B, System Logic Charts. The charts shall support the description given in the Program Maintenance Manual under Paragraph 2.2 Detailed Description. Program Logic Charts will be prepared in accordance with Standard 50-15.

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**APPENDIX D
LISTINGS**

Appendix D shall contain under separate cover the system's listing of coding statements written in symbolic programming language or a higher level language. The listing shall include annotations that establish associations with the system flow charts provided in Appendices B and C.

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3. DOCUMENT REVIEW

3.1 Preliminary Review. The preliminary draft of the proposed Program Maintenance Manual shall be given an appropriate preliminary review to determine that the material contained therein is sufficiently complete to warrant the preparation of a final copy. Acceptance or approval of a preliminary draft in the course of preparation of the proposed Program Maintenance Manual shall in no case be construed as a guarantee of acceptance of the final copy. The preliminary review will include, but not necessarily be limited to, a review of the following features:

- a. Application of reference documents
- b. Format and arrangements
- c. Style and phrasing
- d. Suitability of headings
- e. Length of paragraphs
- f. Physical length of the document
- g. Correctness of cross references
- h. Numbering
- i. Use of abbreviations and symbols
- j. Grammar
- k. Punctuation
- l. Technical accuracy and clarity
- m. Technical completeness
- n. Absence of contractual information

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3.2 Final Review. The final copy of the proposed Program Maintenance Manual shall be given a final review to determine that the requirements of this specification have been satisfied. Final review will include, but not necessarily be limited to, a review of the features listed under preliminary review and the following:

- a. Quality of duplimat
- b. Quality of typing
- c. Reproducibility

4. PROCUREMENT DATA

4.1 Ordering Instructions. Procurement documents concerning Program Maintenance Manuals should specify the following:

- a. Title, number and date of the Program Maintenance Manual
- b. Applicable requirements for packing, packaging and shipment

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Acceptance Test Plans by a computer system developer when required as a part of a NAVCOSSACT project.

1.2 Scope of Specification

1.2.1 General. Each Acceptance Test Plan shall include information starting with Section 1 GENERAL below in the order presented and under the paragraph titles specified. All paragraphs are not applicable to every system for which an Acceptance Test Plan is written and portions not pertinent to a particular system may be designated not applicable by the Project Leader.

1.2.2 Reader Orientation. The Acceptance Test Plan is primarily a tool for directing the implementation of a test. Those parts of the document directed toward the staff personnel are to be presented in non-technical language and those parts of the document directed toward the operations personnel are to be presented in the language of the operations center.

2. CONTENT OF ACCEPTANCE TEST PLAN

The content of the Acceptance Test Plan will be in accordance with the format on the following pages.

1. GENERAL

1.1 Purpose of Acceptance Test Plan. Paragraph 1.1 shall describe the purpose of the Acceptance Test Plan. The description will be in accordance with the following NAVCROSSACT objectives for preparation of an Acceptance Test Plan:

- a. Provide guidance for the management and technical effort necessary throughout the test period, from preparation through the Test Analysis Report.
- b. Establish a comprehensive test plan and communicate to NAVCROSSACT and user management and user operational personnel extent of tests deemed necessary to provide a basis for system acceptance by the user.
- c. Communicate to appropriate user personnel the equipment and organizational requirements necessary for testing the system.
- d. For support systems, provide for ADP operations center evaluation using functional data.
- e. Establish the detailed content of the required testing.
- f. Provide the methodology of the testing to be performed.
- g. Provide a written record of the actual inputs to the test and the expected outputs.
- h. Establish a detailed scenario to permit execution of the test (exercise) by user staff and operator personnel.
- i. Specify test details to exercise limits and critical capabilities of the system.

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1.2 Project Reference. This paragraph shall identify the system by its formal title and number and briefly indicate the type of system involved, scale of operation, usage and/or users, and the relationship to other systems. Emphasized will be any distinguishing features of the system. The organization which will conduct testing of the system will be indicated. This paragraph will also identify the project sponsor and user(s).

1.3 Project Impacts. Paragraph 1.3 shall cite any impacts which the test or operation of the system will impose on equipment, personnel, or operating procedures.

1.3.1 Software. This paragraph shall list the software packages used during and in support of the test which are not a part of the system under test.

1.3.2 Test Site. This paragraph shall indicate the physical location(s) at which the test(s) is to take place, the date(s), and the participating organizations.

1.3.3 Test Milestone Chart. Paragraph 1.3.3 shall provide a horizontal bar type chart to depict the activities and events below. This chart will be in chronological order with supporting narrative as necessary.

- a. Over-all on-site test period and portions of period assigned to major portions of test.
- b. Pre-test on-site period required for system debugging, orientation, and familiarization.

- c. Period assigned for the collection of data base values, input values, and other operational data required for system test.
- d. Period assigned for user orientation and familiarization with system documentation.
- e. Period assigned for compliance with any special test requirements of a particular user.
- f. Periods assigned for preparation, review, and approval of the Test Analysis Report.

1.3.4 Personnel Requirements. This paragraph shall provide a horizontal bar type chart to depict the number and period of use of each skill type required for the entire test period(s). It will indicate special requirements such as multi-shift operation, and assignment or retention of key skills to insure continuity and consistency in extensive test programs.

1.3.5 Equipment Requirements. This paragraph shall provide a horizontal bar type chart to depict the period of usage, and quantity required, of each item of equipment employed throughout the test period, including test data reduction equipment.

1.4 Applicable Documents. Paragraph 1.4 shall itemize by document title and number all documentation specially produced for the project. Include any other documentation describing systems or procedures which supplement or provide for interaction with the subject system during the course of normal operation or at any point in the test phase. Assign a separate identifier to each itemized document to facilitate reference to it in subsequent sections of the Plan.

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1.5 Test Materials. Paragraph 1.5 shall itemize the articles and apparatus associated with the conduct of test. All items not deliverable as part of the operational system should be included under separate heading for clear identification. Examples of test materials follow:

- a. Data base card decks/tapes identified by file type and record size.
- b. Input card deck/tapes identified by input type, test sequence usage, and record size.
- c. Support programs in card/tape form identified by type and record size.
- d. Test control programs or other special test programs in card/tape form identified by type and record size.
- e. Test worksheets and other forms and instructions specifically prepared to control and expedite the test activity, identified by type and quantity.
- f. Apparatus required during or in support of the test, which is not normally part of the equipment configuration or deliverable as part of the system. Apparatus would include extra peripherals (tape drives, printers, plotters), test message generators, test timing devices, test event recorders. Such apparatus will be identified by name, type, and quantity required.

2. SYSTEM TEST REQUIREMENTS

2.1 General Requirement. This paragraph shall provide a general statement of what is to be demonstrated by the test. It will relate this to the Project Request and any modifications thereof.

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2.2 Specific Requirements. Paragraph 2.2 shall list the individual requirements to be demonstrated by the test as derived from the specific performance requirements (Paragraph 2.3.3) in the Preliminary Functional Description.

3. SYSTEM TEST METHODS AND CONSTRAINTS

3.1 System Test Methods

3.1.1 System Test Conditions. This paragraph shall indicate whether the system test is to be made using the normal system inputs (type, magnitude, or frequency) and data base or whether a special set of exercise inputs and exercise data base is to be used.

3.1.2 System Test Means of Control. This paragraph shall indicate whether test is to be controlled by:

- a. Manual Means. Manual insertion of necessary inputs and manual control of test sequence.
- b. Semi-automatic Means. Manual insertion of necessary inputs and automatic (test program) control of test sequence.
- c. Automatic Means. Preparation and use of a special test program to provide necessary inputs, conduct tests, monitor and record test results.

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3.1.3 Extent of System Test. Paragraph 3.1.3 shall indicate the extent of the testing to be employed. Where total testing is not to be employed, there will be presented the test requirements either as a percentage of some well defined total quantity or as a number of samples of discrete operating conditions or values. Also indicated will be the rationale for adopting limited testing.

3.1.4 System Test Sequence

3.1.4.1 Test Progression. In cases of progressive or cumulative tests, there will be indicated the manner in which progression is made from one test to another, such that the cycle of activity for each test, as described in Section 6, is completely accomplished.

3.1.4.2 Test Evaluation. This paragraph will indicate whether test steps are to be performed without interruption for evaluation or whether each step is to be evaluated before testing continues.

3.1.5 Data Recording. Paragraph 3.1.5 shall indicate data recording requirements including those data types not normally recovered from system operation. Data recording is to include:

- a. I/O Events. Time ordered records of I/O activity to explicitly or implicitly correlate interaction.
- b. Test Points. Time ordered records of data values or system condition at selected points within or peripheral to the operating system.

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- c. Data Dumps. Time indexed records of data as stored at selected storage locations within the system at selected points in time, or as a consequence of selected system operations.

3.2 System Test Constraints. Paragraph 3.2 shall indicate the anticipated limitations imposed on the acceptance test due to system or test conditions, such as limitations on timing, interfaces, equipment, personnel, and data base.

4. SYSTEM TEST EVALUATION

4.1 Test Data Criteria. Paragraph 4.1 shall describe the rules by which test results will be evaluated, viz:

- a. Tolerances. Range over which a data value output by a system performance parameter can vary and still be considered acceptable.
- b. Samples. The minimum number of combinations or alternatives of input conditions and output conditions that can be exercised to constitute an acceptable test of the parameters involved.
- c. Counts. The maximum number of interrupts, halts or other system breaks which may occur due to non-test conditions.

4.2 Test Data Reduction. Paragraph 4.2 shall describe the technique to be used for manipulation of the raw test data into a form suitable for evaluation. The available techniques would include:

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- a. Manual. Manual collection and collation of system test outputs into test sequence order followed by visual inspection of the results.
- b. Semi-automatic. Automatic inspection of test results as obtained by data recording means using a test data reduction program, followed by manual (visual) inspection of selected test results which do not lend themselves to complete reduction by automatic means.
- c. Automatic. Automatic inspection of test results specially recorded for manipulation by the test data reduction program. Test results, as recorded, include all items of test significance. The test data reduction program contains an image of correct data outputs for an item by item comparison of data and provides a summary of an evaluated test as output.

4.3 Test Analysis Report. Paragraph 4.3 shall indicate that a test report shall include all tests conducted on the system (see Section 7). It will be stated that the report is to describe the entire results of each test and provide emphasis on those areas where a difference in test and actual conditions applies.

5. TEST/FUNCTION RELATIONSHIPS

5.1 System Functions. Paragraph 5.1 shall provide a detailed list of the system functions which will be exercised in the course of over-all system testing. This list, as derived from the Preliminary Functional Description document (Section 2.3.4), must be ordered in a manner which relates the system functions into the system test requirements of Section 2.

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5.2 Test/Function Relationships. Paragraph 5.2 shall provide a list of tests which taken as a whole constitute the overall test activity. It will also provide, as applicable, a Function-Test Matrix Chart summarizing the over-all allocation of system functions to tests. The matrix shall show the tests as rows, intersected by system functions as columns. Within the cell structure so formed, those functions tested by each test should be indicated (X-symbol).

6. TEST DESCRIPTION

A decimal subdivision of Section 6 shall be used to describe each test as shown in Section 6.1.

6.1 Test (Identify)

6.1.1 Test Inputs. This paragraph shall list the input or inputs to the test with their associated data characteristics. Data characteristics would include:

- a. Type of input (data, elements, command instruction).
- b. Transfer (data rate, volume, period).

6.1.2 Test Outputs. This paragraph shall list the output or outputs from the test with their associated data characteristics. Data characteristics would include:

- a. Type of output (data presentation, status indication).
- b. Transfer (data rate, volume, period).

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6.1.3 Test Conditions. This paragraph shall provide a statement of conditions which exist within the test or as part of the input or output to the test. Conditions would include:

- a. Setting of controlling parameters for the test (minimums, maximums, thresholds).
- b. Enabling conditions for receipt or output of data.
- c. Priority conditions for processing of data (function priorities, system mode priorities).

6.1.4 System Conditions. This paragraph shall provide a statement of conditions which exist within the system prior to test. Conditions would include:

- a. Availability of file data types and elements.
- b. Availability of data, control and status messages from interacting functions not under test.
- c. Mode of system operation (normal, emergency).

6.1.5 Test Control

6.1.5.1 Input Data. This paragraph will describe the manner in which input data is controlled in order to:

- a. Test system with a minimum number of data types and values.

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- b. Exercise system with a range of bona fide data types and values which test for overload, saturation, and other worst case effects.
- c. Exercise system with bogus data types and values which test for rejection of irregular inputs.

6.1.5.2 Input Commands. This paragraph shall describe the manner in which input commands are used to control:

- a. Initialization of test.
- b. Halt or interrupt of test.
- c. Repeat of unsuccessful or incomplete test.
- d. Alternate modes of operation as required by test.
- e. Termination of test.

6.1.5.3 Output Data. This paragraph shall describe the manner in which output data is controlled in order to:

- a. Detect occurrence (or ultimate non-occurrence) of output data (as event) for indication of test completion.
- b. Record or identify permanent location of output data (in entirety) for indication of test performance.
- c. Evaluate output as basis for continuation of test sequence.
- d. Evaluate test output against required output to assess performance of test.

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6.1.5.4 Output Notification. This paragraph shall describe the manner in which output notifications (messages output by the system concerning status or limitations on internal performance) are controlled in order to:

- a. Indicate readiness for test (normal operation condition).
- b. Provide indications of irregularities in input test data or test data base due to intentional or unintentional test procedures.
- c. Provide indications of irregularities in internal operations on test data due to intentional or unintentional test procedures.
- d. Provide indications on the control, status, and results of test as available from auxiliary test supervisor program (if used).

7. SYSTEM TEST PROCEDURE

This Section shall contain the step-by-step procedures to accomplish each test of the system. Each step is assigned a test step number and this number along with critical test data and test procedure information is tabulated onto a test procedure form for test control and recording of test results.

7.1 Test Set-Up. Paragraph 7.1 shall itemize the activities associated with set-up of the computer facilities to conduct the test. Set-up activities will encompass all routine machine activities from power on through console set-up to card/tape read-in. This paragraph shall include distribution of test documents, worksheets, and other forms.

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7.2 Test Initialization. Paragraph 7.2 shall itemize in test sequence order, the activities associated with establishing the conditions of the first test starting with the equipment in the set-up condition. Initialization would accomplish:

- a. Read-out of control function locations and critical data from indicators and storage locations for reference purposes.
- b. Setting or synchronizing time dependent elements in system.
- c. Queuing of data input values for first test.
- d. Queuing of test support programs if used.
- e. Coordination of personnel actions associated with test.

7.3 Test Steps. Paragraph 7.3 shall itemize the test(s) into test steps in test sequence order. It shall also include special operations, viz:

- a. Visual inspection of test conditions.
- b. Data dumps.
- c. Instructions for data recording.
- d. Modifications of data base.
- e. Interim evaluation of test results.

7.4 Test Termination. Paragraph 7.4 shall itemize in test sequence order, the activities associated with termination of the test, viz:

- a. Read-out of critical data from indicators and location for reference purposes.
- b. Termination of operation of time sensitive test support programs and test apparatus.
- c. Collection of system and operator records of test results.

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**APPENDIX
STATEMENT OF PRE-TEST ACTIVITY**

The Appendix shall provide a description of the testing completed as part of the system development activity. This may be provided in the form of a listing of the elements in the Program and Subsystem Specifications against which the program operation has been explicitly checked. The description should include any significant comments on the operation of the individual programs or program subsystems which could affect test or operation of the system.

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**NAVCROSSACT
STANDARDS**

SUBJECT

**ACCEPTANCE TEST
ANALYSIS REPORT**

**NUMBER
40-55**

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1. GENERAL SPECIFICATION INFORMATION

1.1 Purpose of Specification. This documentation specification provides guidance for the preparation of Acceptance Test Analysis Reports by a computer system developer when required as a part of a NAVCOSSACT project.

1.2 Scope of Specification

1.2.1 General. Each Acceptance Test Analysis Report shall include information starting with Section 1 GENERAL below in the order presented and under the paragraph titles specified. All paragraphs are not applicable to every system for which an Acceptance Test Analysis Report is written and portions not pertinent to a particular system may be designated not applicable by the Project Leader.

1.2.2 Reader Orientation. The Acceptance Test Analysis Report has the primary purpose of describing the status of the system after test. It also provides a presentation of deficiencies for review by staff and management personnel. Therefore, the document should be prepared in non-technical language.

2. CONTENT OF ACCEPTANCE TEST ANALYSIS REPORT

The content of the Acceptance Test Analysis Report shall be in accordance with the format on the following pages.

NAVCROSSACT STANDARDS	SUBJECT ACCEPTANCE TEST ANALYSIS REPORT	NUMBER 40-55	
		PAGE 3	OF 5
<p>1. GENERAL</p> <p>1.1 Purpose of Acceptance Test Analysis Report. Paragraph 1.1 shall describe the purpose of the Acceptance Test Analysis Report. The description will be in accordance with the following NAVCROSSACT objectives for preparation of an Acceptance Test Analysis Report:</p> <ul style="list-style-type: none">a. Provide in writing the results of the acceptance test.b. Provide a basis for allocating responsibility for deficiency correction and follow-up.c. Provide a basis for preparation of NAVCROSSACT's statement of completion.d. Establish user confidence in the operation of the system. <p>1.2 Project Reference. Paragraph 1.2 shall state the project title and number and provide a brief summary of the project objectives. This paragraph will also identify the project sponsor and user(s).</p> <p>1.3 Applicable Documents. Paragraph 1.3 shall provide a list of applicable documents by number and title. This paragraph will include at least the following when applicable:</p> <p style="margin-left: 40px;">Preliminary Functional Description Staff Manual Operations Manual Acceptance Test Plan</p>			

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2. TEST ANALYSIS

A decimal subdivision of Section 2 shall be used to describe each test as shown in Section 2.1.

2.1 Test (Identify)

2.1.1 Data Performance. This paragraph shall compare the I/O performance of the test with the I/O capabilities as described in the Staff Manual and the Acceptance Test Plan when applicable.

2.1.2 Parameter Performance. This paragraph shall compare the parameter performance of the test with the parameter performance described in the Staff Manual and Operations Manual and the Acceptance Test Plan when applicable.

3. SYSTEM FUNCTION ANALYSIS

A decimal subdivision of Section 3 shall be used to describe each system function as shown in Section 3.1.

3.1 System Function (Identify)

3.1.1 Function Performance. This paragraph shall describe the functional capability as it has been demonstrated in one or more system tests. It shall also assess the manner in which the test environment may be different from the operational environment and its affect on the functional capability.

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3.1.2 Performance Limits. This paragraph shall describe the range of data and parameter values tested. It shall also identify any functional deficiencies, limitations, or constraints inherent in the system detected during the testing process.

4. CONCLUSIONS AND RECOMMENDATIONS

4.1 Demonstrated Capability. This paragraph shall provide a general statement on the capability of the system as demonstrated by the test, against the performance requirements contained in the system Preliminary Function Description. An individual discussion of conformance with specific requirements may be included on complex systems.

4.2 System Deficiencies. As required by the results of the testing, an individual statement will be provided for each deficiency detected in system operations, as measured against the Acceptance Test Plan. Accompanying each deficiency will be a discussion of the impact on system performance, if the deficiency is retained, and the impact on the system design, if the deficiency is corrected, along with assignment of organizational responsibility for the correction.

4.3 System Refinements. An itemization of improvements which can be realized in system design or operation, as determined during the test period, will be given. Accompanying each improvement will be a discussion of the added capability it provides the system and the impact involved on the system design.

NAVCROSSACT STANDARDS

SUBJECT

PROGRAMMING
TERMINOLOGY

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1. PURPOSE

To establish a glossary of systems terminology for use in the programming environment of NAVCOSSACT.

2. GENERAL TERMINOLOGY

Terminology generally used in the programming field is defined in several government and industry publications, including the following:

Automatic Data Processing Glossary -

Executing Office of the President,
Bureau of the Budget, December 1962

American Standard Vocabulary of Information Processing

(proposed) -
American Standards Association

3. SPECIALIZED TERMINOLOGY

3.1 Terms and Abbreviations. A list of organization identifiers, operational terms, item descriptives and common abbreviations applicable to the preparation of common system documentation is contained in the

NAVCROSSACT Dictionary of Terms and Abbreviations,
25 March 1964

An abbreviation may be used in place of the parent terms for brevity, provided the term is fully spelled when first used, followed by its abbreviation in parentheses.

3.2 Glossary. A list of definitions of specialized NAVCOSSACT terminology is contained in Appendix A.

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APPENDIX A
SPECIALIZED TERMINOLOGY

TERMINOLOGY ORGANIZATION

The terminology included in this Appendix is organized by key word groups. Each term is identified by one and only one key word. All terms with a common key word are grouped together in alphabetical order. Thus, an entry appears only once in the Appendix and multiple listings of a single entry are avoided.

TERMINOLOGY GROUPS

To expedite the search process under the single entry arrangement, all terms contained in the Appendix are listed under their respective groups in Table A-1.

CONFIGURATION

Hardware configuration. The layout or disposition of units of equipment, interconnected or not, that are associated with an ADP facility; e.g., a central message or data processor unit, its array of peripherals (tape units, line units, printers, etc.) and EAM units (keypunch, reproducer, etc.).

Organization configuration. The physical and functional structure of the ADP user's facilities and personnel and particularly those units within this structure that interact with the ADP facility as sources of input data and/or recipients of output information.

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Positional configuration. The pattern or arrangement of the positions required to be manned by personnel during operation and/or maintenance of the ADP system; e.g., console operator, EAM supervisor, staff monitors of displays.

Software configuration. The composition of the aggregate program system associated with an electronic data or message processor. In addition to the operational programs that satisfy the functional requirements of an application(s) there may be included control, (supervisory), support (in-out; data retrieval) and conversion (assembler; compiler) programs.

DATA

Display data. Information output by real time system for immediate evaluation.

Data message. Grouping of related data elements to form a single data set for convenience in transmission and processing.

Parametric data. Data values incorporated into program design used to enable and/or control the program operation.

Priority data. Data identified to the system by tag, type or value limits for special handling.

Protected data. Data stored in system locations accessible for change only by special external manipulations of hardware and/or software elements.

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Safe data. System operational data periodically read out of its dynamic storage location (core, drum, disk) onto a static storage medium (tape) as a contingency against data loss due to catastrophic system failure.

Secure data. Classified data manipulated by system with explicit, automatic safeguards for its transmission and output only to designated authority, usually on clearance level basis.

Sensitive data. Data (usually classified) with additional safeguards for transmission and output to designated authority only on an explicit need-to-know basis.

Simulated data. Fictitious values of data inserted into system, in lieu of actual (usually classified values) as a convenience during test or exercise of the system.

ENVIRONMENT

Hardware (equipment) environment. The assembly of equipments operating as a system.

Operational environment. The complex of personnel, practices and procedures which exists as an organization for the fulfillment of a mission(s).

Organizational environment. The hierarchy of personnel and their associated responsibilities which exist in a given operational situation.

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Physical (site) environment. The assembly of equipment operating as a system, including those aspects of the installation which influence or constrain operation of the system.

REQUIREMENT

A statement in a procurement situation of that which is to be provided to satisfy the procurement. It may be applied at any level of the procurement breakdown; i. e. , operational (user oriented), system (designer oriented), subsystem, program, performance (evaluation oriented).

SYSTEM

System Continuity. Ability of system to maintain normal operation or a stated degree of operation under failure conditions.

System effectiveness. A measure of system performance usually as a function of stated values of the system parameters. Different values of effectiveness will normally be associated with different values or sets of values of the parameters.

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System flexibility. Provision within a system to modify or expand the range or mode of operation in a manner compatible with the basic design.

System impact. The effect on a system of proposed or actual changes. The effect may be measured in terms of performance, schedules or cost factors.

System interface. The technical factors associated with defining the manner in which a system relates to another, totally independent system.

System maintainability. The capabilities and characteristics of a system that support the objective of continuous availability to the user. This capability is represented by the aggregate of maintainability (preventive; remedial) considerations present in the system's design, fabrication, installation, operation, and personnel and logistics support.

System parameter. A quantity representing the performance of a system in a particular area or consideration (e.g., display response time). A parameter is a variable constant in that its value can be within a range of values, but for a given design, configuration, and environment (e.g., traffic load) of the system it is fixed.

System redundancy. The considerations in a system's design and configuration that provide parallel or duplicate on-line facilities (e.g., terminals; lines) and/or functions (e.g., components; circuits; equipments) to support continuity of system operation.

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System reliability. The ability of a system to operate in the manner intended whenever required by its user. A continuously available system would be completely reliable (no failures limiting or discontinuing operation).

TIME

Real time. Ideally, the operation of a system in which input events, conditions or perturbances are processed and output immediately as display information or correction signals to a control unit.

Response time. The period or duration of time to obtain a desired output from a system (or a component) measured from the point in time at which the system (or the component) is stimulated or triggered to initiate the output. Total response time can exceed system response time when input and output preparation are required of operating personnel.

Throughput time. The time required for a system to produce a desired output measured from the time of input initiation. This time will be a function of the task (type of input, processing and output) given the system and the operating speed of the central processor and particularly its electromechanical peripherals (e.g., card reader; printer or card punch).

**TABLE A-1
TERMINOLOGY GROUPS****Configuration**

Hardware
Organization
Positional
Software

Data

Display
Message
Parametric
Priority
Protected
Safe
Secure
Sensitive
Simulated

Environment

Hardware
Operational
Organizational
Physical (site)

Requirement**System**

Continuity
Effectiveness
Flexibility
Impact
Interface
Maintainability
Parameter
Redundancy
Reliability

Time

Real
Response
Throughput

1. PURPOSE

To establish a list of symbols and their meanings for general reference in the preparation of programming documentation linework.

2. SYMBOL TYPES

Symbols are used on a chart to represent the functions of an information processing system. These functions are: input/output, processing, flow direction, and annotation.

A basic symbol is established for each function and is always used to represent that function. Specialized symbols are established which may be used in place of a basic symbol to give additional information. The size of each symbol may vary but the dimensional ratio of each symbol shall be maintained.

Refer to Appendix A for individual symbols and their meanings.

3. SYMBOL USAGE

3.1 Symbol Orientation. The orientation of each symbol on a flowchart should be the same as shown in Appendix A.

3.2 Symbol Size. The size of each symbol may vary, but the dimensional ratio of each symbol shall be maintained as specified in Section 2.

3.3 Flow Direction. Flow direction is represented by lines drawn between symbols.

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- a. Normal direction flow is from left to right or top to bottom.
- b. When the flow direction is not left to right or top to bottom, open arrowheads shall be placed on reverse direction flowlines.
- c. When increased clarity is desired, open arrowheads can be placed on normal direction flowlines.
- d. When flowlines are broken due to page limitation, connector symbols shall be used to indicate the break.
- e. When flow is bidirectional, it can be shown by either single or double lines; but open arrowheads shall be used to indicate both normal direction flow and reverse direction flow.

4. SYMBOL ANNOTATION

The value of chart symbols may be increased by annotation of the symbols with pertinent descriptions and/or numerical values. The conventions which apply are shown in Appendix B.

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APPENDIX A CHART SYMBOLS

The symbols which follow are used to represent processing operations on charts. The size of the symbols may vary depending upon chart layout size and spacing, but the dimensional ratio of width to height (W:H) must be maintained to the values given.

Symbol

Meaning



W:H = 1:2/3

Input/Output. The making available of information for processing (input), or the recording of processed information (output) without a connotation of media used.



W:H = 1:2/3

Processing. The process of executing a defined operation or group of operations resulting in a change in value, form, or location of information, or in determining which of several flow directions are to be followed.

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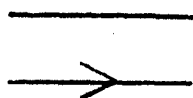
NUMBER
50-10

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Symbol

Meaning

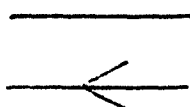
Left to right



Top to bottom



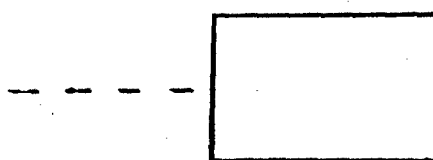
Right to left



Bottom to top



Flow Direction. Flow direction is represented by lines drawn between symbols. Normal direction flow is from left to right or top to bottom. When the flow direction is not left to right or top to bottom, open arrowheads shall be placed on reverse direction flowlines. When increased clarity is desired, open arrowheads can be placed on normal direction flowlines. For broken lines due to page limitation, connector symbols shall be used to indicate the break. When flow is bi-directional, it can be shown by either single or double lines: but open arrowheads shall be used to indicate both normal direction flow and reverse direction flow.



W:H = 1:2/3

Annotation. The addition of descriptive comments or explanatory notes as clarification. The broken line may be drawn either on the left as shown or on the right. It is connected to the flowline at a point where the annotation is meaningful by extending the broken line in whatever fashion is appropriate.



W:H = 1:1/2

Punched Card. I/O function in which the medium is punched cards, including mark sense cards, partial cards, stub cards, etc.

NAVCOSACT STANDARDS

SUBJECT **PROGRAMMING SYMBOLOLOGY**

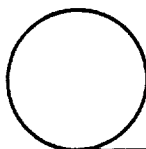
NUMBER
50-10

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12

Symbol

Meaning



W:H = 1:1

Magnetic Tape. I/O function in which the medium is magnetic tape.



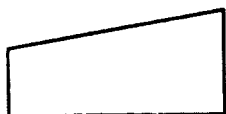
W:H = 1:1/2

Punched Tape. I/O function in which the medium is punched tape.



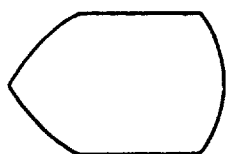
W:H = 1:2/3

Document. I/O function in which the medium is a document.



W:H = 1:1/2

Manual Input. I/O function in which the information is entered manually at the time of processing, by means of on-line keyboards, switch settings, push buttons, card readers, etc.



W:H = 1:2/3

Display. I/O function in which the information is displayed for human use at the time of processing, by means of on-line indicators, video devices, console printers, plotters, etc.

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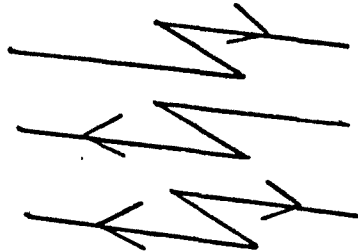
PAGE

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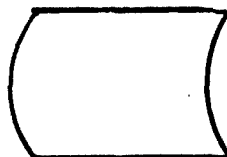
12

Symbol



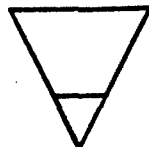
Meaning

Communication Link. I/O function in which information is transmitted automatically from one location to another. The symbol is always drawn with superimposed arrowheads to denote the direction of data flow.



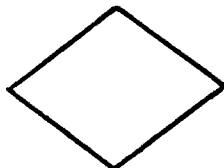
W:H = 1:2/3

On-line Storage. I/O function utilizing auxiliary mass storage of information that can be accessed on-line; e.g., magnetic drums, magnetic disks, magnetic tape strips, automatic magnetic card systems, or automatic microfilm chip or strip systems.



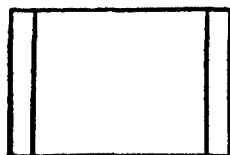
W:H = 1:1

Off-line Storage. Any off-line storage of information, regardless of the medium on which the information is recorded.



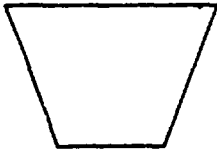



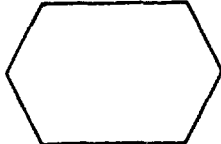
W:H = 1:2/3

Decision. Operation that determines which of a number of alternate paths is to be followed.



W:H = 1:2/3

Predefined Process. A named process consisting of one or more operations or program steps that are specified elsewhere; e.g., subroutine or logical unit.

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Symbol	Meaning	
 W:H = 1:2/3	Manual Operation. Any off-line process geared to the speed of a human being.	
 W:H = 1:1	Auxiliary Operation. An off-line operation performed on equipment not under direct control of the central processing unit.	
 W:H = 1:1	Connector. A junction in a line of flow. A set of two connectors is used to represent a continued flow direction when the flow is broken by the physical limitations of the flowchart. A set of two or more connectors is used to represent the junction of several flowlines with one flowline, or the junction of one flowline with one of several alternate flowlines.	
 W:H = 1:3/8	Terminal. A point in a system of communication network at which information can enter or leave; e.g., start, stop, halt, delay or interrupt.	
 W:H = 1:2/3	Preparation. Action or task preceding or following the processing of data on EAM or EDP equipment.	

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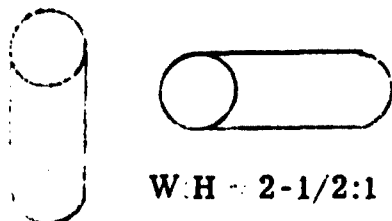
8

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12

Symbol

Meaning



W:H = 2-1/2:1

W:H = 1.2-1.2

Magnetic Drum. A right circular cylinder with a magnetized surface on which data can be stored by selective magnetization of portions of the curved surface.



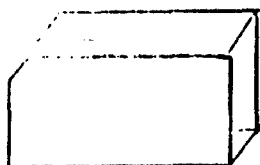
W:H = 1.1-1/2

Magnetic Disk. A flat circular plate or coaxial assembly of same, each having a magnetic surface on which data can be stored by selective magnetization of portions of the flat surface.



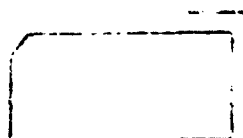
W:H = 1:1

Magnetic Core. A configuration of magnetic material (e.g., ferrite cores) placed in a spatial relationship to current carrying conductors. Data can be stored by selective magnetization of the magnetic material.



W:H = 1.2/3

Deck of Cards. A collection of punched cards comprising one or more files and associated control cards.



W:H = 1-1/2

File of Cards. A collection of related records (punched on cards) treated as a unit.

NAVCOSSACT STANDARDS

SUBJECT

**PROGRAMMING
SYMBOLOLOGY**

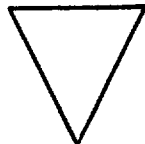
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Symbol

Meaning



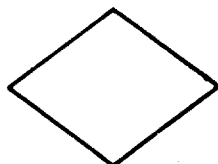
W:H = 1:1

Merge. The combining of two or more sets of items into one, usually in a specified sequence.



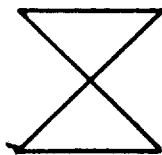
W:H = 1:1

Extract. The formation of a set of items selected from items contained in one or more sets.



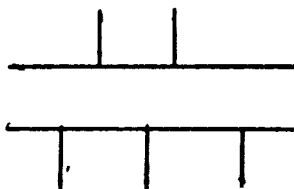
W:H = 1:2/3

Sort. The arrangement of items in an ordered sequence according to specified rules.



W:H = 1:1

Collate. The comparison and merging of two or more similarly ordered sets of items into one ordered set.



Parallel Mode. The simultaneous transfer or processing of the individual elements (e.g., bits) of a whole (e.g., word).

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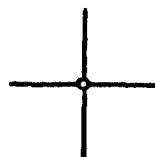
12

Symbol



Meaning

Crossing. The traversing of two or more chart lines which does not result in a junction or common union.



Junction. The intersection of two or more chart lines at a common union point, terminal or node.

APPENDIX B CHART SYMBOL ANNOTATION

The information content of chart symbols (Appendix A) may be enhanced by the addition or annotation of additional data within the symbol itself. The more common items of data annotated onto the most frequently encountered symbols are located within the symbol as follows:

Symbol

Meaning

Processing.

EQ	PI
OP	

EQ = Equipment designation
PI = Program identification
OP = Description of operation

Punched Card Data.

FD
FI
EV

FD = File description name
FI = File identification
EV = Estimated card volume

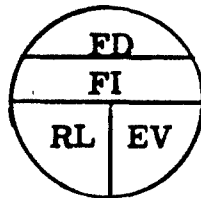
Document.

RT
RI
EV

RT = Report title
RI = Report identification
EV = Estimated volume in lines per report

Symbol

Meaning



Magnetic Tape.

FD = File description name

FI = File identification

RL = Record length

EV = Estimated volume



Paper Tape.

FD = File description name

EV = Estimated volume of records

1. PURPOSE

To establish a set of flow chart types to be used and referenced in the preparation of programming system documentation.

2. CHART TYPE VARIATIONS

This standard provides for the preparation of a number of chart types to fulfill the need for variations in the emphasis and detail required in flow charting at the various levels of programming documentation. Associated with each chart type is a unique type name for convenient and unambiguous reference to the type in program systems documentation.

3. CHART TYPE**3.1 System Organization Chart**

- a. **Purpose.** Provide an over-all view of the system configuration for the orientation of general management, staff and operating personnel requiring a basic understanding of the system.
- b. **Content.** Block diagram representation of identified functional areas, activities related to the ADF facility with interconnecting data-information flow lines between applicable blocks. See Figure 1 for simplified example.

3.2 System Information Flow Chart

- a. **Purpose.** Provide a comprehensive presentation of the flow of data-information within the over-all system for the benefit of management, staff, and operating personnel. The objective is to show the trace of input data from initial generation through the system to final output recipient(s).

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PROGRAM SYSTEM
CHART TYPES

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- b. **Content** Block and symbolic representations of input data, operation, and output information in the various functional areas of the organization with interconnecting lines denoting forward and feedback flows of data and information. See Figure 2 for simplified example. (Pictorial representations of equipments, e.g., teleprinters, tape-punches, key punches, etc., may be included for additional clarification and understanding of the flow and handling of system data information.)

The chart is primarily for the use of ADP operators and programming personnel. All blocks and symbols should be fully labeled and identified in regard to unit ID, run or operation number, data types, etc.

3.3 Physical Configuration Chart

- a. **Purpose** Present physical arrangement of system to support description of system operation in user documentation.
- b. **Content** Simplified layout of system equipments as installed at site(s) showing individual equipment outlines and their relative positions. See Figure 3 for simplified example.

3.4 Functional Configuration Chart

- a. **Purpose** Present system equipment in block diagram form with interconnections to support description of system operation in system documentation.

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b **Content.** Block diagram of system equipments, grouped by function with indication of basic data flow. See Figure 4 for example.

3 5 Integrated ADP Flow Chart

a **Purpose.** Present all significant aspects of data flow for use as a means of communication of system design between user and system analyst, and to provide basis for development of detailed system design.

Note. For complex systems an Integrated Flow Chart is prepared for each major sequence or cycle and related by a single system chart.

b **Content.** A complete data path including data operations and inter-relationships throughout system, depicted with ADP symbols. See Figure 5 for simplified example.

3 6 In/Out Flow Chart

a **Purpose.** Provides the system operator with the basic sequence for the use of the program system and input materials to produce an output.

b **Content.** The sequence of events in ADP symbols which display the manipulation of input and intermediate output materials related to the appropriate system processing operation. See Figure 6 for example

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3.7 System Logic Chart

- a. **Purpose.** Provide a means of communication of detail program operation between system analyst and programmer.
- b. **Content.** The sequence of processing events in ADP symbology to be performed by the computer as prepared for each program in the program system. See Figure 7 for example.

3.8 Program Logic Chart

- a. **Purpose.** Provide a definition of the organization of the logic of each program in the program system for design, debug and test purposes.
- b. **Content.** The sequence of logic processes for a program described in compiler level language. See Figure 8 for example.

3.9 Coding Logic Chart

- a. **Purpose.** Provide a definition of the coding used for a program. Normally prepared only when a compiler is not used.
- b. **Content.** A step-by-step presentation of the coding instructions as they will appear in the finished program. See Figure 9 for example.

4. CHART TYPE APPLICATIONS

The information depicted by the various chart types is applicable to a wide variety of documentation needs. Selection of a particular type will be determined by the technical depth and interests of the intended reader. Table 1 provides a guide for use of individual chart types in programming system documentation.

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TABLE 1

Chart Type ↓ Appropriate Documentation ↑		SYSTEM			DESIGN			MANUALS			TEST	
		PRELIMINARY FUNCTIONAL DESCRIPTION	DATA REQUIREMENTS	SUBSYSTEM SPECIFICATION	PROGRAM SPECIFICATION	DATA BASE SPECIFICATION	STAFF MANUAL	OPERATIONS MANUAL	PROGRAM MAINTENANCE MANUAL	ACCEPTANCE TEST PLAN	ACCEPTANCE TEST ANALYSIS REPORT	
Fig. No.	Title											
1	System Organization	X										
2	System Information Flow	X										
3	Physical Configuration						*	*		*		
4	Functional Configuration						*	*				
5	Integrated ADP Flow	X	X				X	*				
6	Input/Output Flow	*	X				*	*				
7	System Logic	*	X	X				*	X	*		
8	Program Logic			X					X			
9	Coding Logic			X					*			

X - denotes application of chart type

* - denotes suggested application of chart type

X - denotes application of chart type

* - denotes suggested application of chart type

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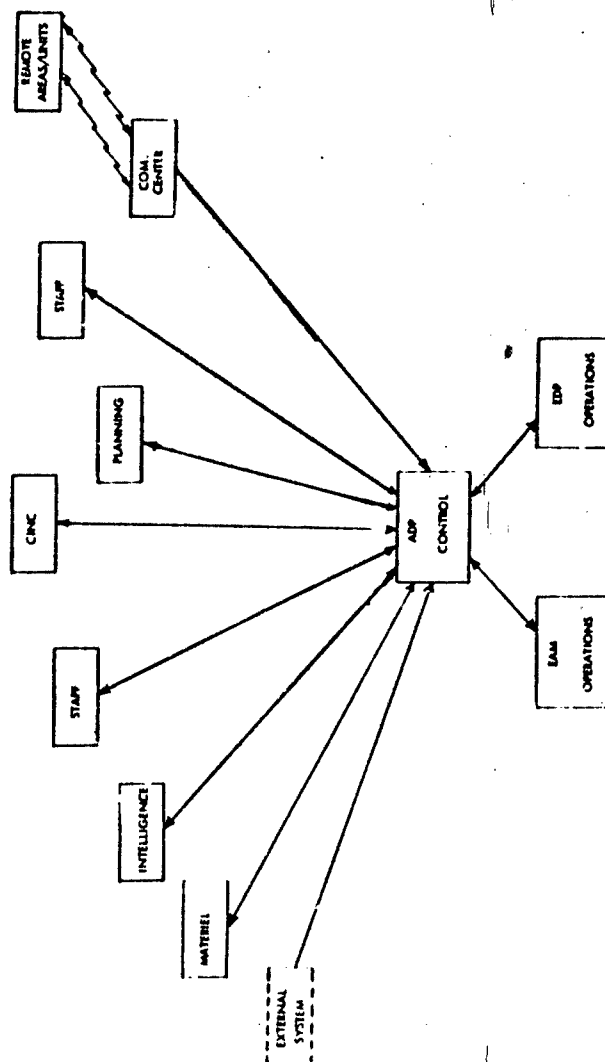


FIGURE 1 SYSTEM ORGANIZATION CHART (EXAMPLE)

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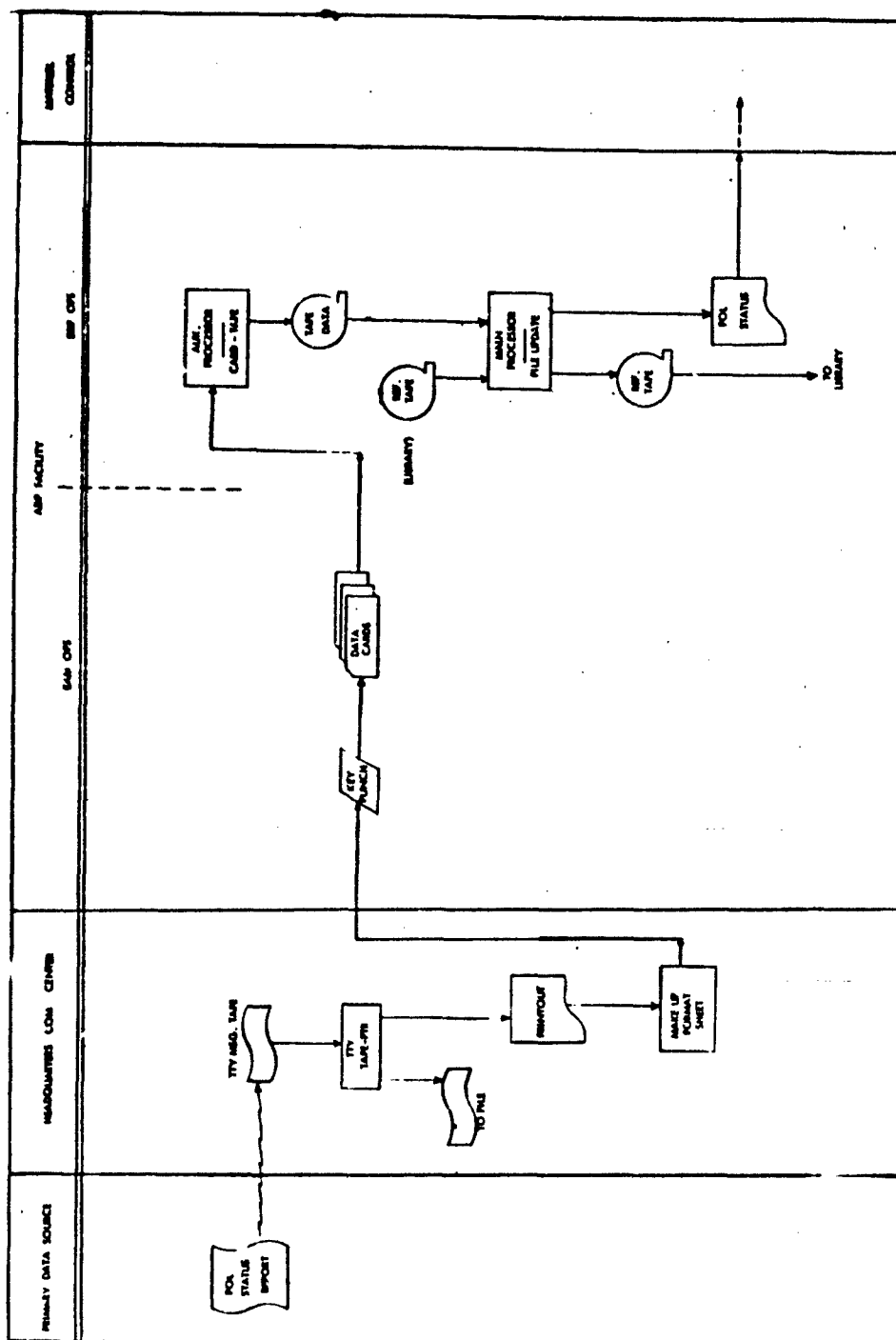


FIGURE 2 SYSTEM INFORMATION FLOW CHART (SAMPLE)

STANDARD 20-2

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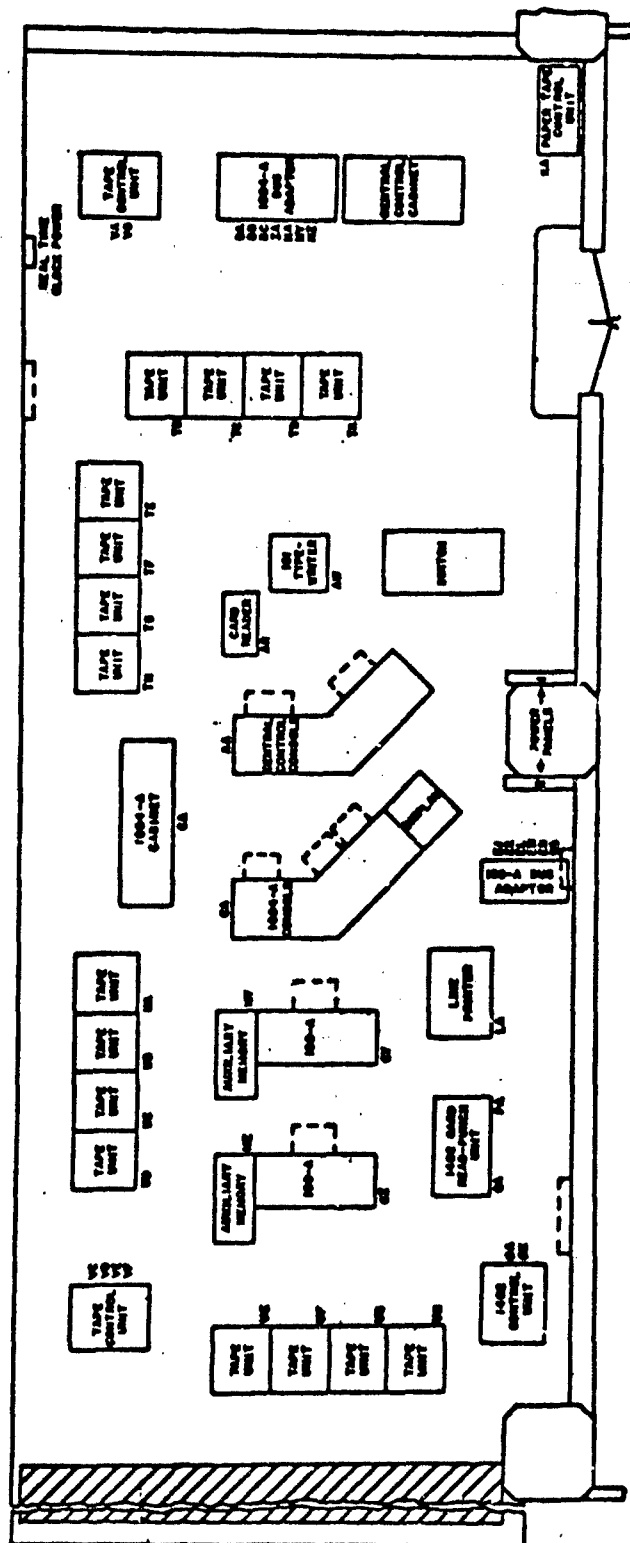


FIGURE 3 - PHYSICAL CONFIGURATION CHART (EXAMPLE)

STANDARD 50-15

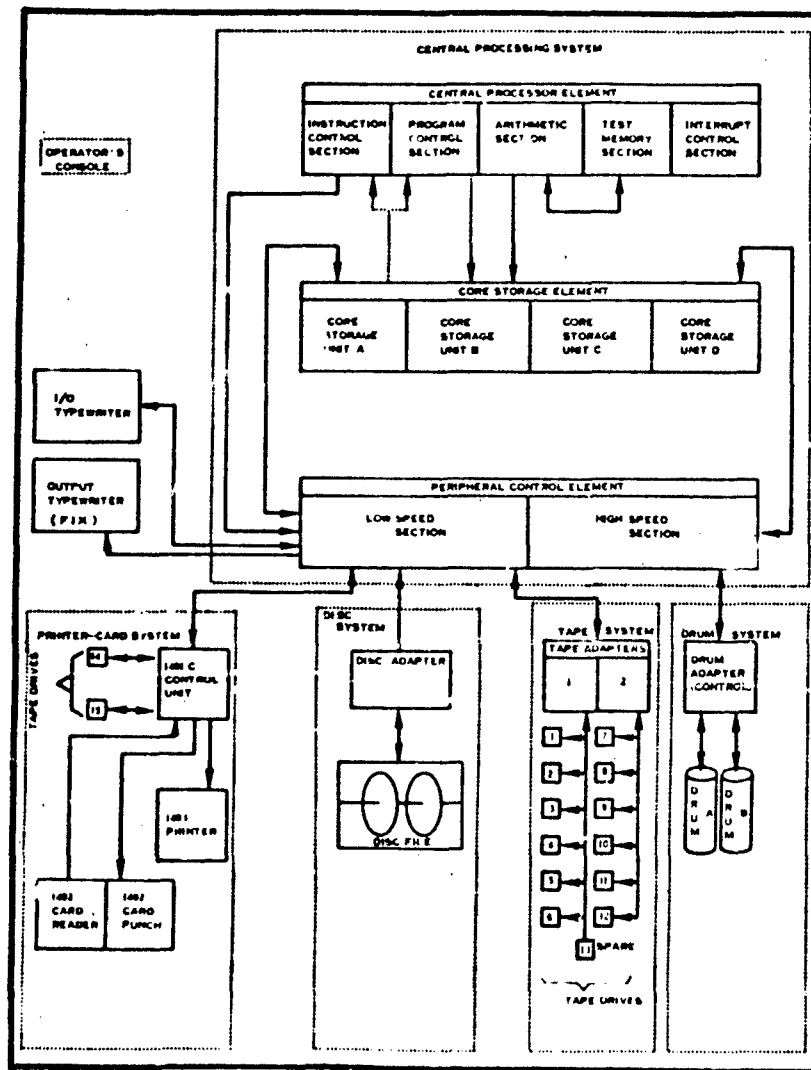


FIGURE 4 - FUNCTIONAL CONFIGURATION CHART (EXAM)

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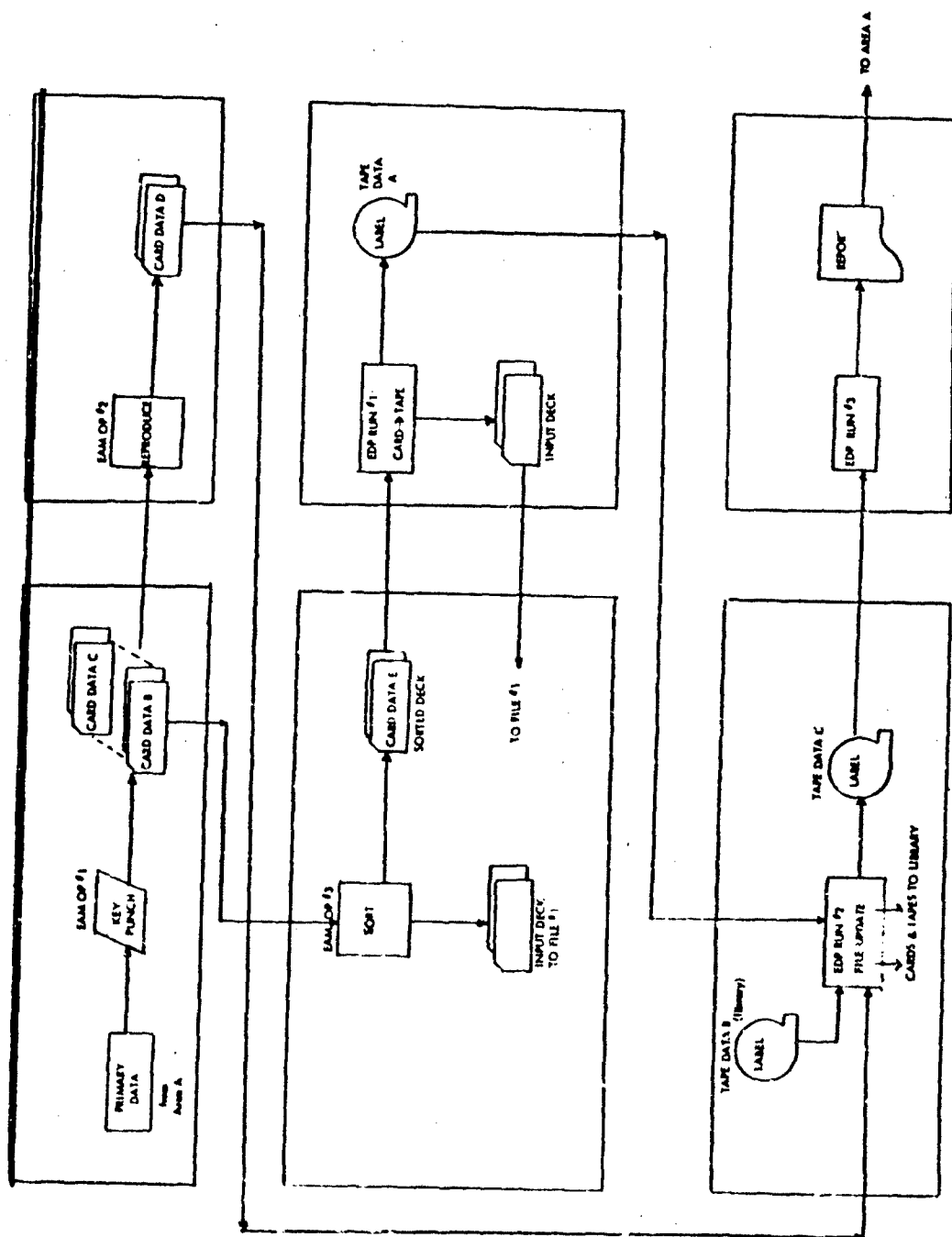


FIGURE 5 INTEGRATED ADP FLOW CHART (CYCLE A) (EXAMPLE)
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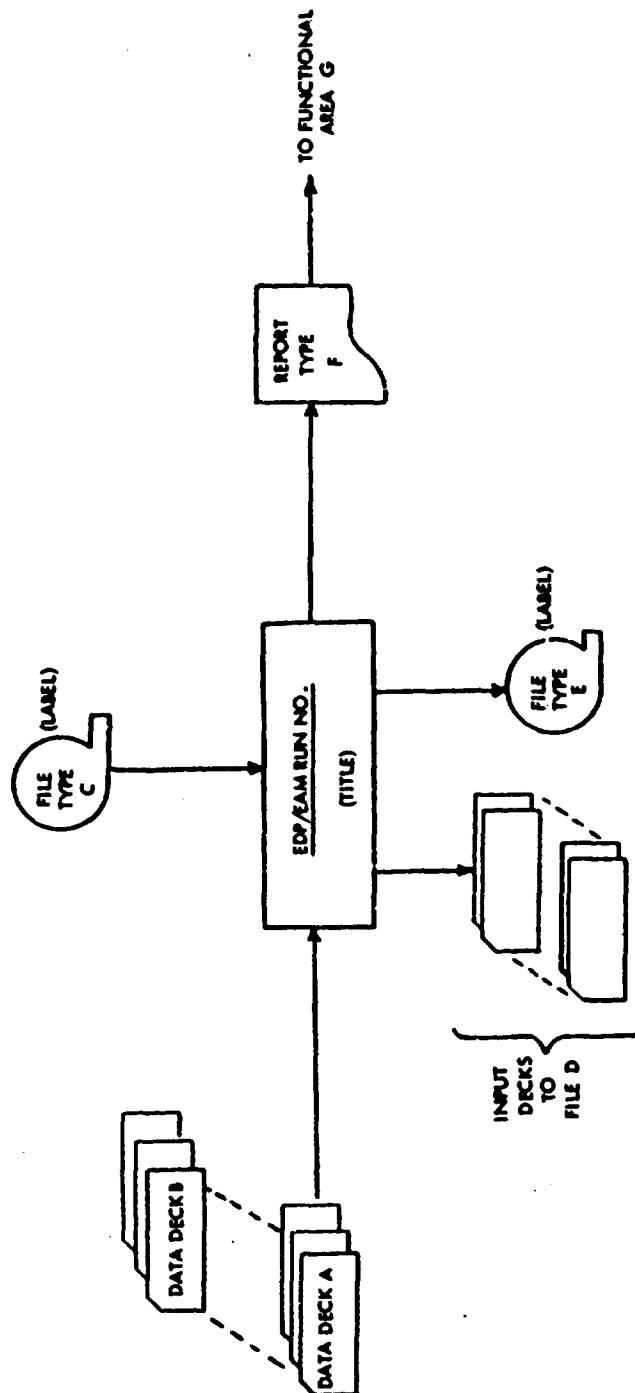


FIGURE 6 IN-OUT FLOW CHART (EXAMPLE)

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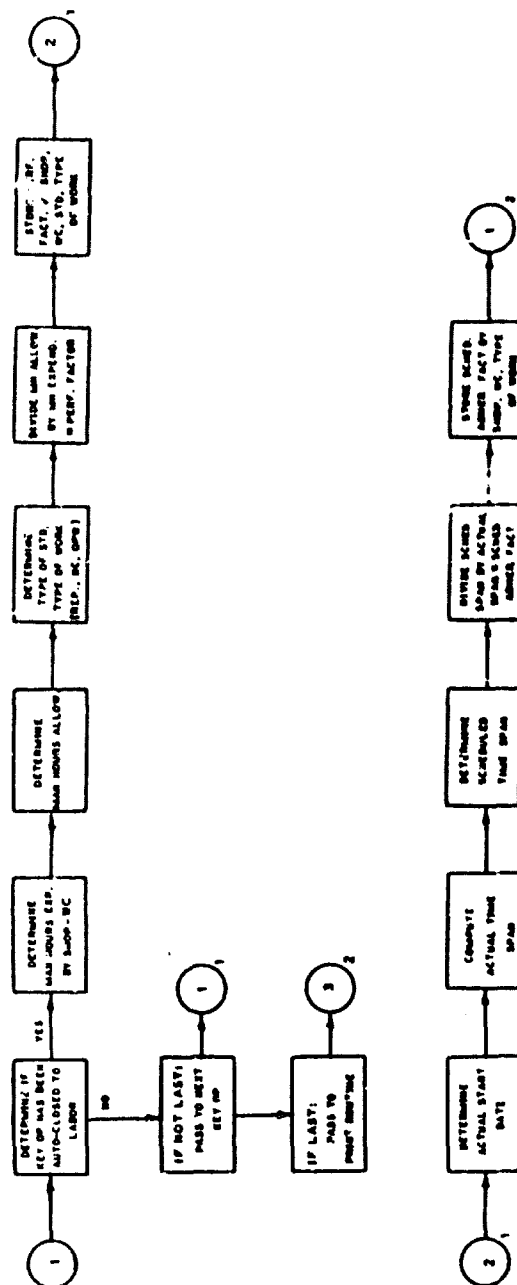


FIGURE 7 - SYSTEM LOGIC CHART (EXAMPLE)

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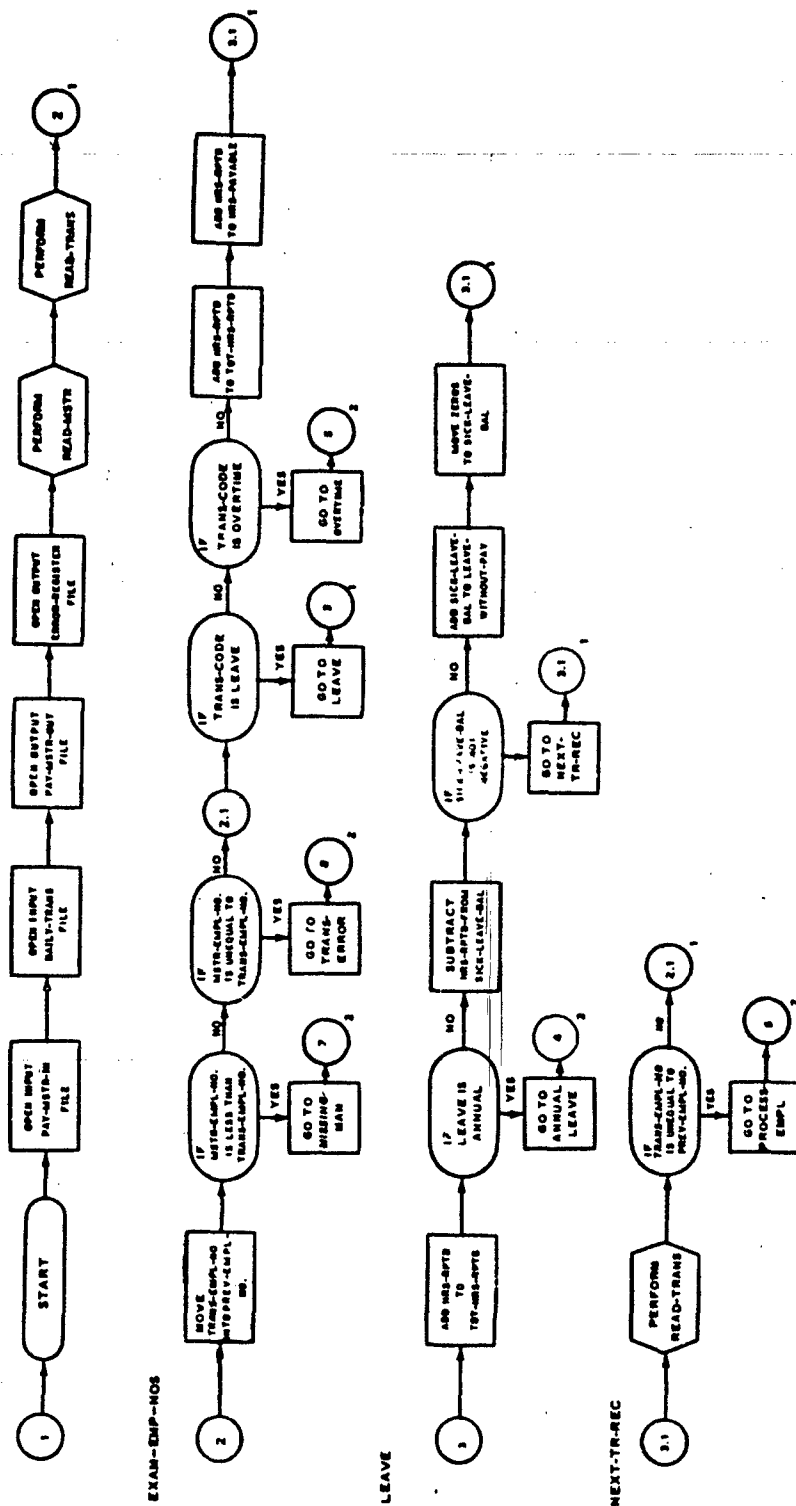


FIGURE 8 - PROGRAM LOGIC CHART (EXAMPLE)

STANDARD 50-15

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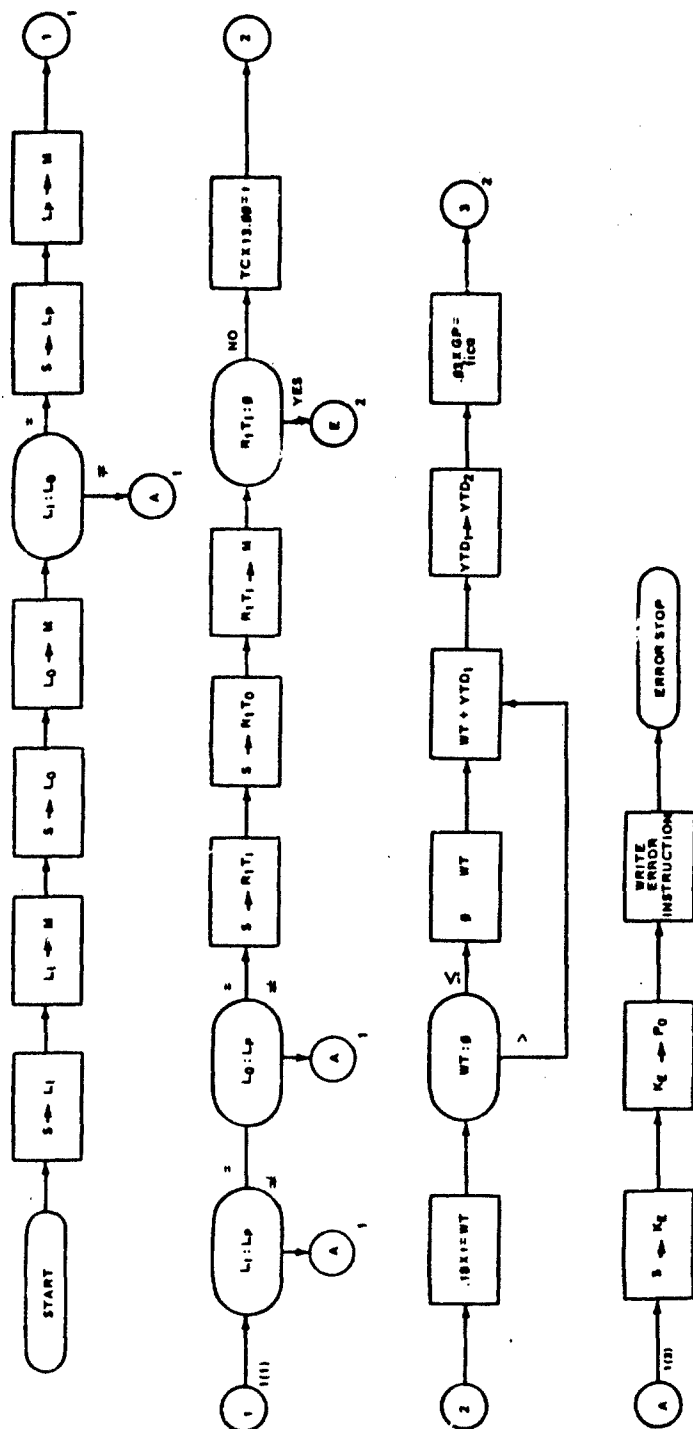
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13. ABSTRACT		
<p>This document represents the final technical report developed under Contract Number Nonr-4958(00) (NAVCROSSACT Project Number 90A012, Study of Programming Documentation Standards and Specifications). The basic document presents the research program implemented by ITT/DISD in developing the NAVCROSSACT programming documentation standards and specifications which are provided in the Appendix.</p> <p>The objective of Project 90A012 was to develop standards and specifications for NAVCROSSACT programming documentation that would be generally applicable to all NAVCROSSACT projects. The standards were to be sufficiently broad, yet detailed enough to be applicable to programming documentation requirements of any NAVCROSSACT software system. The specifications for the various kinds of programming documents were to be derived from, and were to reference, the documentation standards, thereby enabling a consistency of documentation throughout all NAVCROSSACT projects. A hierarchy of documentation was to be established that would provide a logical relationship among documents and would permit sufficient flexibility for appropriately covering all types of software systems.</p> <p>The conclusions in the Report indicate that the program employed was effective for this type of project and the objectives were achieved as embodied in the Appendix.</p>		

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14 KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Programming Documentation Standards Programming Documentation Specifications Data Processing Documentation Standards Computer Program Documentation Standards ADP Documentation Standards EDP Documentation Standards Systems Documentation Standards						

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